HISTORIC STRUCTURE REPORT

THE MONOCACY AQUEDUCT

HISTORICAL DATA

CHESAPEAKE AND OHIO CANAL NATIONAL HISTORICAL PARK

MD. – D.C.- W.VA.

by

Harlan D. Unrau

DENVER SERVICE CENTER
HISTORIC PRESERVATION TEAM
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR
DENVER, COLORADO

January 1976

CONTENTS

LIST OF ILLUSTRATIONS

ADMINISTRATIVE DATA
And Recommendations

A. *Name of Structure*

Aqueduct No. 2 (Monocacy River), Chesapeake and Ohio Canal National Historical Park, Frederick County, Maryland.

B. *Proposed Use of Structure and Justification for Such Use*

The List of Classified Structures has not been completed yet for the canal. Therefore, the Order of Significance of Aqueduct No. 2 has not been established nor has the level of treatment been determined. Because Aqueduct No. 2 was basic to the functioning of the canal and is considered an outstanding engineering accomplishment of the period, it will undoubtedly figure prominently among the historic resources of the waterway.

Accordingly, it is recommended that appropriate preservation/stabilization treatment be given immediately to Aqueduct No. 2 to prevent its further structural deterioration. Because the draft master plan proposes to develop as a Cultural Interpretive Zone the stretch of canal between Lock No. 27 and Nolands Ferry, in which Aqueduct No. 2 is located, it is recommended that future consideration be given to the full restoration of this structure.

C. *Provision for Operating Structure*

Aqueduct No. 2 should be used as an historic structure exhibit in place to interpret the construction, maintenance, and operation of the canal.

D. *Cooperative Agreements Executed or Proposed for Operating Structure.*

There are no cooperative agreements or other documents bearing on the management, operation, or use of this structure.

E. *Description of Proposed Construction Activity*

A definitive description of proposed construction activity cannot be made for Aqueduct No. 2 until all studies have been completed. However, it is imperative that appropriate preservation/stabilization treatment be given immediately to this structure to prevent its further deterioration.

Recommendations

The records pertaining to the Chesapeake and Ohio Canal Company in the National Ar-chives, the Library of Congress, the Maryland State Archives at Annapolis, and the Maryland State His-torical Society at Baltimore have been thoroughly examined for this report. Therefore, it is the opinion of the author that no further historical research needs to be done on Aqueduct No. 2.

However, the Monocacy Basin, located just below the aqueduct, merits further considera-tion for future research. Covering an area 500 feet long and 100 feet wide, the basin served as a local trade center, Canal Company records indicate that several docks and warehouses were built around the basin during the period of canal operation. The remains of a mill building at the east end of the basin are still visible. Accordingly, it is the opinion of the author that the study of the Monocacy Basin should be incorporated into an historical interpretive study of the major basins along the canal. This study would thus contribute to a better understanding of the economic im-pact of the C & O Canal on the Potomac River Valley.

PREFACE

This report has been prepared to satisfy in part the research needs for the preservation/stabilization of Aqueduct No. 2 (Monocacy) on the Chesapeake and Ohio Canal. Altogether eleven aqueducts were built by the canal company to span the major tributaries of the Potomac River. Of these, Aqueduct No. 2 was the longest, containing seven arches and measuring 438 feet between the abutments. Thus, it represented a major engineering accomplishment during the 1830s.

A number of persons have assisted in the preparation of this report. Thanks are due to Superintendent William R. Failor and Park Ranger Ellwood Wineholt for assistance at the park headquarters; to Maria Joy and Robert Kvasnicka of the National Archives who were helpful in suggesting and locating unpublished documents; and to Dr. Harry Pfanz and Barry Mackintosh of Park Historic Preservation (WASO), Supervisory Historian John F. Luzader, Historical Architect Thomas N. Crellin, and Editor Linda Greene of the Historic Preservation Team (DSC) for reading the manuscript and providing editorial assistance.

Harlan D. Unrau
July 10, 1974

Note to This Edition

The original Historic Structure Report was transcribed by volunteers and subsequently edited and formatted by library volunteer Karen Gray in November, 2011. This edition was prepared for general use primarily in electronic form and some changes were made for this purpose. Also the Afterword was added along with additional illustrations to reflect the aqueduct's stabilization project completed in 2005.

I. HOVEY AND LEGG BEGIN CONSTRUCTION

Before proposals for the construction of the aqueduct across the Monocacy River, or Aqueduct No. 2 as it was designated, could be invited, land for the right of way would have to be purchased. Land on the east side of the Monocacy River was owned by Dr. Charles C. Byrd, who had built a house and mill between the Monocacy and Little Monocacy rivers in the late eighteenth century.[1] On July 16, 1828, Byrd sold 4 acres and 6 rods of land to the Chesapeake and Ohio Canal Company for $80.20, subject to the following stipulation:

> In receiving from Dr. Charles C. Byrd the within conveyances, it is agreed in behalf of the Chesapeake & Ohio Canal Company that if the Chesapeake & Ohio Canal be carried across the Monocacy at the point of his ferry or at any other point on his land whereby the ferry shall be destroyed or materially injured, he shall be entitled to compensation therefore on the principle of damages prescribed in the Charter of the Company. Dr. Byrd in such case agrees however, if the Company prefer it, to receive his compensation in stock of the said Company.[2]

Land on the west bank of the Monocacy River belonged to Christian Kemp. On March 24, 1829, an inspection was made of "3 acres, 2 rods, and 16 perches" of his land, and a Frederick County jury awarded him $210 in damages.[3]

The board of directors, on August 9, 1828, determined that

> public notice be given that proposals will be received between the 15th & 20th days of October next for the entire section of the Canal between the mouth of Seneca and the Eastern base of Catoctin Mountain, being about 27 miles, in half mile sections, embracing the Locks, about four in number, and the Aqueducts and culverts of that section.[4]

Although the contract for Aqueduct No. 2 was not to be let until October, the firm of Hovey and Legg submitted a proposal in August when the bids for construction of the canal from Little Falls to Seneca were examined by the board. After the examination of the proposals was concluded, the board, on August 20, accepted the offer of Hovey and Legg.[5]

---

[1] Edward McMillan Larrabee, "A Survey of Historic and Prehistoric Archeological Sites Along the Chesapeake & Ohio Canal National Monument, 1961-1962" NPS study, 1961, p. 27. The ruins of these structures may still be seen between the towpath and river about one-tenth of a mile below the aqueduct. During the early 1800s a store and post office were operating in these buildings.

[2] Deed, Byrd to C & O Co., July 16, 1828, Deeds and Other Records Concerning Land Titles, C & O Co.

[3] Reference Book Concerning Land Titles, 1829-68, p. 191. Also see "Inquest on Land Held by Christian Kemp," Mar. 24, 1829, Deeds and Other Records Concerning Land Titles, C & O Co.

[4] Proceedings of the President and Board of Directors, A, 37.

[5] *Ibid*, p. 43.

In late October, Chief Engineer Benjamin Wright "prepared ground plans and elevations of the aqueducts at Seneca Creek and Monocacy River." The plan for Aqueduct No. 2 was drawn

> with a water way 19 feet at bottom—20 feet at top. The towpath parapet 8 feet wide and the other wall 6 feet wide. I have drawn the plan to 7 arches of 54 feet span each and 6 piers and two abutments. The piers are 10 feet thick, and a pilaster at each end of the pier projecting one or two feet and 7 feet wide.
>
> By calculation there will be about 8,500 perches including wing walls, and the price of 6-3/4 dollars per perch I think no more than a fair price—if it is done in that solid substantial manner which I have described to Mr. Hovey. The whole of the arches are to be cut to patterns so that every stone is cut thro and thro the arch. The piers and abutments are to be cut and rusticated if required. The arch ring stone to be also rusticated two inches. The spandrel and parapet walls and inside of the trunk to be cut and bottom flagged with cut stone if so directed or the bottom covered with well jointed plank if it shall be considered best. Coping to extend across the whole of parapet and project one foot if required.[6]

On October 31 the board accepted certain changes in contracts for canal work. One of these changes was the substitution of Hitchcock for Legg as a partner of Alfred B. Hovey for the construction of Aqueduct No. 2.[7]

On November 29 the board extended the "time limited in a memorandum of agreement for making a formal contract with Hitchcock and Hovey, for the aqueduct over Monocacy River" to "any part of the month of December next."[8]

> In December the board adopted the following resolution concerning Aqueduct No. 2:
>
> That an estimate be made by the acting member or members of the Board of Engineers, and reported to this Board, of the cost which would attend the enlargement of the breadth of the Monocacy Aqueduct, so as to admit the free passage of boats moving upon it, at the same time in opposite directions.[9]

Before construction could begin on a large scale along the line of the canal, the availability of an adequate supply of hydraulic lime for cement had to be determined. Stone of a suitable quality had been discovered near Shepherdstown, on the Virginia side of the river, early in 1828, and a mill and kiln operated by Boteler and Reynolds had been erected to grind and burn the lime.[10] The Potomac Mills created a new industry in the region, and a "whole new science" began.[11] Accordingly, on February 21, 1829, the board directed Inspector of Masonry Robert Leckie to

---

[6] Wright to Board of Directors, October 1828, Ltrs. Recd., C & O Co.
[7] Proceedings of the President and Board of Directors, A, 100. This change is confusing because later requisitions for work done were made out to the firm of Hovey and Legg.
[8] *Ibid*., p. 119.
[9] *Ibid*., p. 122.
[10] Boteler to Mercer, Jan. 14 and 22, 1828, in *Chesapeake and Ohio Canal Report*, 20th Cong., 1st sess., 1828, H. Doc. 141, pp. 38-39.
[11] Walter S. Sanderlin, *The Great National Project* (Baltimore, 1946), pp. 66-67.

"proceed to make a contract with Messrs. Boteler and Reynolds for the delivery of fifty thousand bushels of water lime."[12]

Herman Boye, the resident engineer of the 5th Residency of the lst Division, reported on March 28 to Nathan S. Roberts, a member of the Board of Engineers, that Hovey "had a large quantity of stone quarried which is of no use to him in the construction" of the aqueduct "but which would answer very well for culverts." Accordingly, Hovey agreed to construct the Tuscarora Creek Culvert on Section No. 76 "for such price as may hereafter be given for work of the same character." He would also take contracts for the two culverts on Section No. 73 on similar terms should the company not accept the proposals of Contractor Cantfield for these structures.[13]

Inspector of Masonry Leckie, on April 8, notified the board of directors that a blue hydrate of lime had been discovered about 100 yards from the kilns constructed by Messrs. Boteler and Reynolds, which "he considered to be of superior quality to that which had been contracted for." The board thereupon instructed Leckie "to extend the contract with Boteler and Reynolds to 100,000 bushels of water cement provided they will manufacture it of the blue hydrate at 17 cents per bushel." If they did not agree to these terms, Leckie was "to allow them a reasonable additional price for furnishing the existing contract manufactured of the blue stone."[14]

On April 22 Hovey and Legg were paid $1,434.03 based on their first monthly estimate of work done on Aqueduct No. 2.[15] The following month on May 13, the contractors received $1,497.60 for work done in April.[16]

The canal company president, Charles F. Mercer, reminded the resident engineers in a circular dated May 15 that "as the Locks, Lockhouses, culverts and Aqueducts are advancing, too much attention cannot be paid to the manner of constructing them." The resident engineers were urged to make sure that the contractors complied with "their contracts with the company" and "the instructions of the Engineer in Chief and of the Inspector of Masonry."[17]

Because the canal company had difficulty recruiting sufficient numbers of stone cutters and masons from the Potomac Valley to work on the canal, the board began to consider ways of solving the labor shortage. Accordingly, on May 20, the board authorized President Mercer

> to engage the services of 300 stone cutters & masons from Europe, and further, that he be authorized to make such composition with the contractors for masonry, as will enable them to invite to the canal, stone cutters & masons, from other parts of the United States, by advancing, on the arrival on the line of the canal of such workmen, to the contractors, such sums of money as may be necessary to pay the cost of their transportation, to be deducted from the assessments of the respective contractors.[18]

---

[12] Proceedings of the President and Board of Directors, A, 171.
[13] Boye to Roberts, Mar. 28, 1829, Letter Book of the Resident Engineer of the 5th Residency of the lst Division.
[14] Proceedings of the President and Board of Directors, A, 195-96.
[15] *Ibid*., p. 208. See Appendix A for a breakdown of the monthly estimates for work done on the aqueduct.
[16] *Ibid*., p.225.
[17] "Circular Instructions to the Resident Engineers, Their Assistants and Rodmen," May 15, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[18] Proceedings of the President and Board of Directors, A, 226.

Resident Engineer Boye, on June 1, informed Dr. John Martineau, member of the board, that he had "sounded [the] Monocacy river (when very low) with a tolerable good instrument." The results of the sounding satisfied him that "the bed [of the river] is rocks the whole distance across." However, it was covered "with a layer or stratum of gravel (very compact) varying from 1 to 3 ft. in thickness." Although this would insure a solid foundation, coffer dams would still be necessary.[19]

On June 7 Boye reported to Chief Engineer Wright that Contractor Hovey was unwilling to "construct a blind arch unless an additional allowance is made as nothing has been said about it in the specification." Because Hovey had never constructed a blind arch, Boye had offered to furnish him "with certain points through which the arch is to pass," which could be used as a substitute for centering. With these points and "the proportion or dimensions of the extrados & intrados, a pretty regular arch could be laid." Nevertheless, Boye conceded that "should the blind arch not be laid perfectly true, it would be very apt to break wherever any deficiency in this respect existed, unless strong ballast or abutments prevented it which latter I suppose it is intended to reduce by introducing the blind arch."[20]

The following day Boye again wrote to Chief Engineer Wright telling him that he had "just seen the bed of the river where the first coffer dam has been sunk." Although the gravel prevented "a fair exposition of the rock," Boye felt that his earlier conclusions had been correct. He believed that the Monocacy was "probably crossed by one or more independent ridges." Where the ridges crossed the river the bottom was "a sandstone of a reddish colour of a similar character to that at Seneca."

According to Boye, Hovey was of the opinion "that what was exposed to view might be large stones, and wished to know whether a timber foundation would be required." However, Boye was certain that "the depth of general inclination of the strata [was] too distinctly marked in that portion which is exposed to view" to have been done by the "usual operations of water courses." From the present appearance it seemed to him that the ridge had "a depression where the lower side of Pier will be placed." Instead of "reducing the whole bed with the coffer dam to a general level," Boye thought it would suffice "to make a square step or offset in the rock which should be filled with one course of stone, if possible to the height of the other part." This latter course of action was especially needed as it was "on the lower end of the Pier which will never be much exposed to ice or driftwood." Because another coffer dam would be sunk within a few days, Boye urged the chief engineer to come to the Monocacy River to "see the first course of stone laid."[21]

On June 10 Hovey and Legg were paid $2,177.10 based on work done during May.[22]

Resident Engineer Boye, on June 15, sent an order to Boteler and Reynolds for water lime for Aqueduct No. 2. On June 23 Superintendent A. B. McFarland notified Boye that 49 bags and 8

[19] Boye to Martineau, June 1, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[20] Boye to Wright, June 7, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[21] Boye to Wright, June 8, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[22] Proceedings of the President and Board of Directors, A, 285.

barrels containing 138 bushels of cement had been sent to the Monocacy Aqueduct.[23] That same day McFarland recommended to Boye that "every master of a boat who intends taking any of the cement in bags should be provided with tarpaulings [sic] to cover their boats." Otherwise, much of the cement might be damaged before it reached the various construction sites.[24]

On July 8 Hovey and Legg were paid $941.04 for work done on Aqueduct No. 2 during June.[25]

McFarland, on July 12, informed John P. Ingle, company clerk, that the low stage of the Potomac River was slowing the production of cement at the Potomac Mill. McFarland also reported that Inspector of Masonry Leckie had informed him "that a cement of an excellent quality has lately been discovered on the Tuscarora Creek, not inferior in any respect to the cement" at Shepherdstown.[26]

On the same date, Resident Engineer Boye sent directions to Contractor Hovey "relative to the laying of the foundations and piers" of Aqueduct No. 2. These instructions were as follows:

> All and every part to be laid solid in mortar, and the grouting only to be trusted to fill the vertical joints and the vacuities at the corners that are too small to be filled up with regular masonry; but, if the irregularity at the corners are large enough to admit of being filled in the regular way it should be done every 15 inch course in depth so that all the vertical joints and irregularities may be completely filled.
>
> Every face stone should be laid on its bed with a hoisting machine. The superintendent of masonry is decidedly of opinion that a fixed crane will not effect this and that shears with strong fore & aft guyes and loft tackles should be used. For it is absolutely necessary that the Stone should be first tried or laid down on its bed dry when a proper stone mason will directly see what sort of a bed is wanted to make the stone lay as it should do. The stone is then hoisted about 18 inches and a bed of mortar put on when the stone is again to be let quietly down on its bed. All the large stone in the center of the piers should also be laid in the same way.
>
> The backing stone at present used is entirely too small and should be mixed with large blocks so as to give the greatest possible strength and bond to the face stones of the pier (unless it be for the bed of the foundation course where a partial crystallization may sometimes be useful to withstand the mechanical action of the water produced within the coffer dam by pumping or otherwise & thus be prevented from washing away).
>
> The cement should never be made in larger quantity than can be disposed of immediately. One-third part of sand is about the right proportion. The front board of the mortar bed should be taken away and beaters made of plank used to mix it completely together. Mr. Leckie rec-

[23] Boye to Boteler and Reynolds, June 15, 1829, and McFarland to Boye, June 23, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division. During the next 5 weeks, Hovey ordered the following amounts of cement: July 13—37 bags and 9 barrels containing 111 bushels; July 27—6 bags and 32 barrels containing 144 bushels; August 1—30 bags and 31 barrels containing 188 bushels.
[24] McFarland to Boye, June 23, 1829, Letter Book of the Resident Engineer of the 5th Residency of the lst Division.
[25] Proceedings of the President and Board of Directors, A, 307.
[26] McFarland to Ingle, July 12, 1829, Ltrs. Recd., C & O Co.

> ommends the handle to be about 5 ft. long, and the pounding part about 2-1/2 ft. and 6 inches broad. The angle of the pounding part to the handle should be that which will enable the operator to stand nearly upright when the bottom of the pounding part is parallel to the floor of the mortar bed. The cement should not have too much water put in it at front, but should be pounded and water added to it until it is worked into a paste as tough as putty; by this process of beating the cement is completely mixed, and every particle of sand enveloped in cement. The strict observance of this last process is absolutely requisite.
>
> Strict attention must in fact be paid to bringing up the granite basement to a uniform level, so as to receive the first course of cut stone without any underpinning.
>
> The rocky bed of the river must also be made level before the granite stone is laid down.[27]

Inspector of Masonry Robert Leckie wrote to the board of directors on July 23 warning them that Hovey would never complete Aqueduct No. 2. According to Leckie, Hovey was "totally ignorant of every principle of geometry and masonry, and has trusted the cutting of his stone to an ignorant Irishman who has spoilt [sic] the whole of the basement course." While it was "susceptible of being partially remedied," Leckie feared the basement course would "be a botch at last." No attention had been paid to the masonry or mixing of the cement, and the sets made of the Tuscarora lime at the aqueduct were "not of a quality to justify" his dependence on the recent experiment. He had therefore instructed Boteler and Reynolds "to forward cements as fast as possible and to procure strong bags at the expense of the company to transport it." Because Engineer Boye was sick with a bilious fever, Leckie intended to delegate responsibility for overseeing the construction of the aqueduct to Mr. Phillips.[28]

In a letter of the same date, Leckie informed Phillips to consider himself "in the employment of the Board of the Chesapeake and Ohio Canal in acting as assistant inspector of masonry of the Monocacy Aqueduct untill [sic] the future pleasure of the board" was intimated to him. Along with this notice of employment, Leckie also forwarded further instructions for the construction of the piers:

> You will perceive the importance of haveing [sic] the Piers laid in the best possible manner; the face stone must be laid solid down on their beds; with a hoisting machine, the block of stone must first be tried down dry without any mortar, then hoisted and the bed put on and the stone let gently down on it, untill [sic] the mortar come out all round, and the stone by [sic] as solid as when it was in the quarry.
>
> The filling in, must also be laid solid in mortar and chuct [sic] hard down in like manner solid, and every 16 inches in depth after being so laid in mortar should be grouted to fill up any irregularities in the vertical joints, that may have escaped the notice of the workmen.
>
> You will pay particular notice to the mixing of the cement, and see that it is only mixed as it is wanted.

---

[27] Boye to Hovey, July 12, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[28] Leckie to Board of Directors, July 23, 1829, Ltrs. Recd., C & O Co.

> The bad beds and joints on the 30 inch course render it impossible to follow the plan by taking in a foot on each side at once instead of which, two intakes are to be made of 6 inches [for] each course whereby the stone will have a much better bearing and the irregularity of the upper bed in a great measure remedied. You will see that the stone are jointed fair at least 6 inches from the face.[29]

On July 23 the board directed the resident engineers along the line of the canal to "give notice to the several contractors for masonry" that they were "expected to supply themselves with the Shepherdstown cement for their work, it being now ready for delivery at that place of an approved quality."[30]

On July 28 Superintendent McFarland rescinded the order "for making cement bags at Shepherdstown," because a reexamination of the specimens revealed "that the quality of the stuff will not answer." Because some of the contractors had complained that the quality of the cement from Shepherdstown was undesirable, he sent some specimens of set cement and "cement in the raw state" to Leckie for examination.[31]

On August 12 Hovey and Legg received $804.11 based on their monthly estimate of work done during July.[32]

Boye, on August 25, forwarded to Chief Engineer Wright data he had acquired from Contractor Hovey concerning the transportation of stone to the construction site of Aqueduct No. 2. In regard to the transportation of stone from Mr. Nelson's quarries at the base of nearby Sugarloaf Mountain to the Monocacy, Boye had found from frequent observation that "a 2 horse team will haul in one day about 25 loads, each load averaging about 5 supfl. ft." Considering each horse as equal to one man and counting the driver and two tenders, five hands were required for each team. At a cost of $1 per day "per man," the cost for the transportation of each superficial foot was 4 cents. Occasionally, four-horse teams or teams of 4, 6, or 8 oxen were used, all of which averaged about the same price.

The transportation of the stone down the Monocacy River to the site of construction was estimated by Boye to "be about 75 cts. per ton or nearly 11 cts. for every supfl. foot." A boat could carry an average of 6 tons a trip and make eight trips a week. Each boat required "a compliment of 5 hands, which at the rate of $1 per hand will be $6 counting the boat equal to $1." One cubic foot of this stone weighed nearly 160 pounds, which would "give 14 cubic ft. to the ton." From his own measurements Boye had found "that the stones cut for the Aqt. will average about 2 ft. bed, which will render every supl. foot equal to 2 cub. ft. or 7 supfl feet to a ton." Thus, the cost for transporting stone from Mr. Nelson's quarries to the aqueduct by way of the river would be "about 15 cts. per supl. ft. or 7-1/2 cts. per cub. ft., or $1.03 per ton." The price for cutting this stone was generally 25 cents per superficial foot, but the price for quarrying had not yet been determined. Because only a small amount of stone had been transported entirely on land over the 5-

[29] Leckie to Phillips, July 23, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[30] Ingle to Boye, July 23, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[31] McFarland to Leckie, July 28, 1829, Ltrs. Recd., C & O Co.
[32] Proceedings of the President and Board of Directors, A, 328.

mile distance from Sugarloaf Mountain to the mouth of the Monocacy, Boye had not estimated its costs.

Regarding the white stone from Mr. Johnson's quarry, Boye was certain that the transportation would "not exceed $1.40 per ton or 20 cts. per supl foot, assuming the same specific gravity as for the former [Mr. Nelson's quarry] which however will not hold strictly true." A maximum price for cutting the white stone was, according to Boye, 50 cents, while the quarrying would average 13 cents. Hence, the whole cost of the white stone would be "83 cts. per supl. foot, while that of Mr. Nelson's will be but 44 cts., exclusive of quarrying." Since Hovey had complained recently that the cutting of the stone had cost him more than 50 cents per superficial foot, Boye asked Wright to consider whether Hovey should be paid an additional sum of money for opening the quarries. Thus far, Hovey had cut 9,680 and quarried another 1,680 superficial feet of stone. Of this amount, 5,760 feet (of which 5,260 feet had been cut) had been delivered to the site of the aqueduct. About 800 feet of the stone had been taken by way of the Monocacy River, while the rest had been transported entirely by land.[33]

On September 25 Hovey and Legg were paid $2,000 for work done on the aqueduct during August.[34]

President Mercer on the same date reported to the board that he had received from Contractor Hovey "such assurances and explanations, in answer to all my complaints of past delay, or neglect, that my confidence in him is fully restored." Hovey agreed to accept laborers recently engaged by the canal company. The contractor also proposed to substitute Tuscarora cement for that of Shepherdstown in the construction of the aqueduct, the expediency of which was to be decided by Chief Engineer Wright and Inspector of Masonry Leckie. However, if the Shepherdstown lime was to be used, Mercer urged that immediate arrangements be made "by land or water carriage, or both, for an adequate supply, that the abutment and piers of the aqueduct may be carried 'up' to the skew backs before the winter."[35]

During October, Chief Engineer Wright made an inspection of the canal. Below Seneca he found everything "moving on tolerably well & with few exceptions the contractors appear to be commencing with some vigor." Above Seneca, however, the contractors were "not so vigorous in their exertions."

Wright reported that Hovey "ought to build the piers and abutments of the Monocacy Aqueduct as high as the spring of the arch this year." Unless "great exertions" were made to forward this work, it could "hardly be expected that the whole work can be completed next year." Josiah Johnson, on whose land Hovey was "now getting stone of a better kind than any other found in the country," had recently threatened to get an injunction to stop Mr. Hovey on the grounds that no formal arrangements had been made with him for the stone. If Johnson took this course of ac-

---

[33] Boye to Wright, Aug. 25, 1829, Letter Book of the Resident Engineer of the 5th Residency of the lst Division.
[34] Proceedings of the President and Board of Directors, A, 362.
[35] *Ibid*., pp. 358-59. Five days later, Mercer recommended that Mr. Rourk be given compensation for "an examination of the line of the canal, for his labour in collecting hands and the means of preserving Mr. Hovey's work, and to prepare for its prosecution without further delay." Mercer to Board of Directors, Sept. 30, 1829, Ltrs. Recd., C & O Co.

tion, Wright feared that "it would be a serious injury to Mr. H [ovey] and stop his work immediately." While Johnson professed "great friendship to the Canal," Wright observed that it was evident that he felt "he had got an advantage and seemed inclined to improve it."[36]
Hovey and Legg, on November 7, were paid $436.50 based on their monthly estimate of work done during October.[37]

Inspector of Masonry Leckie, on November 14, notified Assistant Engineer Charles Ellet of the 5th Residency that the masonry on Aqueduct No. 2 was "so bad that no dependence can be put in it." According to Leckie, the "filling in of the pier, instead of being laid solid in mortar, is thrown in and does not deserve the name of masonry." Thus, much of the mortar work on the piers would have to be taken up and relaid.

Leckie also instructed Ellet in the manner of accomplishing the work. The cement was to be prepared according to the following procedure:

> The cement should be missed up with 1/3 of its quantity of good clear sand and well worked and beat up and as stiff as it can be used and no more water put in than is sufficient, with a good deal of work to make it of a proper consistence; cement prepared in this manner is tough like putty, and sets equally and well; too much water spoils it.

Concerning the cut-stone facing, Leckie wrote:

> Every stone should be lewised and hoisted; it should be first tried down dry on its bed if it batters in the face as is commonly the case; it should be raised behind and at each corner a flat piece stone should be put in, so as to bring the front face square and plumb, with the range of the wall: The stone is then hoisted 18 inches, and the bed made up with chips, laid solid in mortar, so as to give the whole stone an equal bearing; a bed of mortar is then laid on and the stone lowered carefully down on it, and settled to its bed with several blows of a heavy wooden mallet, until the mortar come out all round, and the ashlar have as solid a bearing as when it lay in the quarry.

Leckie also gave directions regarding the piers, as follows:

> The filling in of the pier should be done in the most careful manner; the materials should be placed so as to give the greatest strength, forming headers across the pier so as to bind into each other in the best manner to bind the pier together, and each piece should be laid in full mortar, and struck down to its bed as before directed; the inequalities among the larger pieces should be filled with smaller pieces fitted as neatly as possible to the space, and every piece so laid as to have a flat bearing (not thrown in on edge) and also laid in full mortar and struck down to its bed. You may grout the top of each course if you please.
>
> In freezing another great care should be taken that the mortar be worked clean up, so that no frozen lumps remain on the wall which might by thawing make the wall to settle, and no

[36] Wright to Board of Directors, Oct. 21, 1829, Ltrs. Recd., C & O Co.
[37] Proceedings of the President and Board of Directors, A, 392.

> more mortar should be made at a time than can be used during the day, as it never setts [sic] well a second time.[38]

After an inspection of Aqueduct No. 2 in late November, Chief Engineer Wright reported on the progress of work by Hovey and Legg. Three piers were up to the skewbacks and one other was begun. Accordingly Wright felt that if "the foundation of the 6 piers was in and the abutments raised to [the] skewbacks, it would be better than to leave it as it is, because it might then be finished in one season after." As it was now, he doubted whether the aqueduct "could be all done in one season with economy."[39]

On December 2 an attachment "was laid by the Deputy Marshall of the District of Columbia on any credits of Hovey and Legg in the hands of the Company at the suit of Thomas Coe for $416.63-1/2/100 debt, and $60 incidental cost."[40]

Chief Engineer Wright, on December 4, notified Ellet that Hovey had left the line of the canal. Accordingly, he ordered Ellet to stop the stonecutters from working, because the company did not want to pay them. All construction on the aqueduct was to cease "except so far as to save all the work now done."[41]

On that same date, Clerk Ingle informed Assistant Engineer Ellet that Hovey had conveyed to him in trust for the canal company the following materials:

4,420	feet superficial of cut stone
3,820	feet superficial of cut stone delivered
1,980	feet superficial of quarried stone
550	feet superficial of quarried stone delivered
4,070	feet running of hewn timber delivered
50	pounds iron

The coffer dams had also been paid for by the company as had some of the blocks and cordage.[42]

The board, on December 7, ordered that the account "of M. S. Roach & others for securing machinery and boats at Aqueduct No. 2 be paid, and charged to the account of Hovey & Legg." Following a report from Wright that Hovey had abandoned his contract for Aqueduct No. 2 and left the work, the board adopted the following resolution:

> It having been reported to the Board by the Engineer-in-chief and by the Inspector of Masonry, that the execution of the work on the Monocacy Aqueduct was in many parts unfaithfully done, notwithstanding repeated remonstrances made by them to the contractor, Mr. Hovey, and also, it being reported that the said Hovey has since abandoned the work and gone off.

---

[38] Leckie to Ellet, Nov. 14, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[39] Wright to Board of Directors, Nov. 20, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[40] Proceedings of the President and Board of Directors, A, 412.
[41] Wright to Ellet, Dec. 4, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division
[42] Ingle to Ellet, Dec. 4, 1829, letter Book of the Resident Engineer of the 5th Residency of the 1st Division.

On motion, it was

> Resolved, that the Board do consider and declare the contract for said work dissolved and forfeited; and, that the Clerk proceed to adjust and make a settlement of the account relative thereto without delay.
>
> Resolved, that Mr. David Canfield or some other person be employed to secure, under the direction of the Engineer-in-Chief, such of the piers of the Aqueduct now built, as may be exposed to injury by freshets; Provided, he will undertake to do the same without delay, upon such terms as the Engineer shall consider reasonable.[43]

The following day Wright asked Ellet to find Hovey's representative and "to take an exact account of all stone cut of every kind and description." Each stone was to be described "as to thickness and size and every particular so that we can easily understand them." All timber that had been brought for the use of centers or coffer dams was to be noted and taken where it would "be safe and be secure against the highest freshet."[44]

[43] Proceedings of the President and Board of Directors, A, 414-15.
[44] Wright to Ellet, Dec. 8, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.

II. A. P. OSBORN CONTINUES CONSTRUCTION

The board, on December 9, 1829, received a report from Chief Engineer Wright on the subject of further operations on Aqueduct No. 2. Included in the report was a letter from Asher P. Osborn, the contractor for Sections Nos. 13-14 and Culvert No. 17, proposing "to complete the work according to the terms and for the prices of the late contract, and requesting leave to associate in the work him, John Legg." The proposal was accepted with "the condition that 20 per cent be retained from each estimate until the contract shall be completed, and with a fixed price of $100 being established for each coffer dam and bailing."[1]

That same day Wright notified Ellet that A. P. Osborn had received the contract for Aqueduct No. 2. Accordingly, the chief engineer sent specific instructions to be given to Osborn as he proceeded on the work. The directions were as follows:

1st To secure all the present work so that it can pass over the spring flood safely.
2nd He is to commence at Mrs. [Mr.?] Nelson's quarry and get all the necessary stone for the remaining piers and the two abutments.
3rd He is to get all the stone for the spandrel walls at Mrs. [Mr.?] Nelson's quarry.
4th He may take his choice to get the parapet walls between the water table & the coping at Mrs. [Mr.?] Nelson's or he may get them of the white stone.

You will bear in mind that the piers and abutments are to be of red or grey stone up to the skewbacks, the skewbacks are to be of white stone.

The pilasters are to be of the red stone.

The ring stone and the arch sheeting to be of the white stone, or the sheeting may be in part of red stone if the contractor shall prefer it.

The spandrel walls up to the water table to be of the red stone.

The water table to be of white stone.

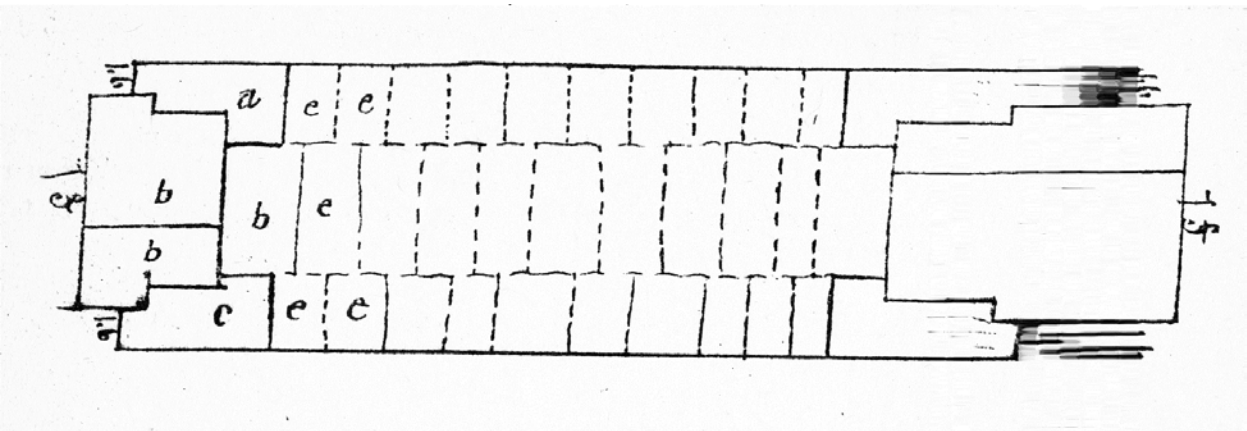
The parapet walls to be of red or white stone but not mixed.

The coping to be of white stone.

I am thus particular that the contractor may not mix these different qualities of stone, and use them for the same parts of the work.

[1] Proceedings of the President and Board of Directors, A, 419.

Wright drew a diagram to illustrate how he wished to have the skewback stones joined at the corner:



> You will recollect that these stones are to be cut with a great deal of care and the inner joints are to be as well cut as the outer faces and so that the stones a, b, b, b, c shall form a solid resistance against each other and prevent the pressure of the arch from giving away at all.
>
> The same may be said of e, e, e, e, e. These should be so put together as to form a solid mass of stone and capable of resisting any lateral thrust which the arch and the superincumbent weight can bring upon it.

In order for the work on Aqueduct No. 2 to proceed systematically, Wright directed Ellet to make a diagram "of each course of stone in each pier and in each abutment." This way the assistant engineer could "ascertain what deficiency there is in the stone necessary for the piers and abutments" when he inventoried the stone on hand.

Because Mrs. [Mr.?] Nelson's quarry at the base of Sugarloaf Mountain was "only hired for one year ending in March next," Wright felt that "every exertion should be made to improve it." All the stone "now cut and those to be cut" were to be brought down to the Monocacy River "as fast as conveniently can be." With this stone, Osborn was to "put up the three remaining piers and the abutments up to the skewbacks and there let them remain."

The next thing Osborn was to accomplish was the cutting of the spandrel walls at Mrs. [Mr.?] Nelson's quarry. These walls were to "be of any thickness down to 12 inches," and they were "to be square joints and truly cut."

The parapet walls, according to the plan of the aqueduct, were "to be 5-1/2 or 6 feet between the water table and the bottom of the coping." These walls "ought to be in 3 or 4 courses and with good wide beds."[2]

In answer to an inquiry by Ellet, Wright, on January 6, 1830, wrote that stone from Mrs. [Mr.?] Nelson's quarry should be used for the water table. The rings of the skewbacks were to come

[2] Wright to Ellet, Dec. 9, 1829, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.

from Mr. Johnson's quarry, but the interior of the skewbacks could come from Mrs. [Mr.?] Nelson's quarry. To insure uniformity, the skewbacks "for the rings at the ends ought to be the same as the ring."[3]

Wright, on February 5, informed Ellet that "Osborn wants money and ought to have it to forward our work." Accordingly, he ordered the assistant engineer "to make out with all possible speed an estimate for work done on the Aqueduct in labour & materials."[4]

On the same date the board directed Inspector of Masonry Leckie to "procure patterns for the ring-stone of Aqueduct No. 2."[5]

On February 9 Leckie sent "a pencil sketch of the locations of the respective bids of cement" to President Mercer, giving him "a tolerable knowledge of how they are situated." After examining the cements that morning, he found "that the setts [sic] from Mr. Johnson's will not take so much sand, and of course could not be so advantageous as that on Carrel's [sic] manor." The Monocacy Aqueduct, according to his estimate, would "require nearly 40,000 bushels [of cement] itself."[6]

President Mercer, on February 20, informed Resident Engineer Boye that the board had bargained with Charles Carroll of Carrollton "for the use of certain quarries of lime stone on his land." At the same time the directors had made an agreement with "Messrs. Brackett & Guy for manufacture of 40,000 bushels of hydraulic lime for our aqueducts, culverts and locks." Accordingly, it was necessary that Carroll's tenants be informed that the board had Carrol's permission to bargain with any of them who may be affected by the undertaking of Messrs. Brackett and Guy for such compensation or indemnity, for entering and passing in and out of their fields or grounds as may be reasonable." Because the board was to pay such compensation, it was necessary, in order to guard their interest, that "some agreement should be made with the tenants before Messrs. Brackett and Guy commence their operations, or that the measure of indemnity be left to future determination, either by reference to disinterested referees or to a jury under a writ of ad quod damnum." Therefore, Boye was to visit the tenants and learn "from them the places from which the limestone is to be taken" and "know which of courses they prefer." In carrying out this duty, Mercer authorized him to assure the tenants "that for any damage done them, by Messrs. Brackett & Guy's operations, in quarrying, burning, grinding & delivering the lime, they shall be justly and fully indemnified."[7]

---

[3] Wright to Ellet, Jan 6, 1830, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division

[4] Wright to Ellet, Feb. 5, 1830, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.

[5] Proceedings of the President and Board of Directors, B, 22. A thorough search of Record Group 79 failed to turn up these patterns.

[6] Leckie to Mercer, Feb. 9, 1830, Ltrs. Recd., C & O Co.

[7] Mercer to Boye, Feb. 20, 1830, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division. Charles Carroll of Carrollton, a signer of the Declaration of Independence and one of the wealthiest men in America, had built a home in 1765 near the mouth of the Monocacy River along Tuscarora Creek on a 10,000 –acre tract. After a long career in public service, Carroll retired in 1804 to manage his landholdings, consisting of about 80,000 acres in Maryland, Pennsylvania and New York, and his business interests. The latter included investments in the Potomac Company, the predecessor of the Chesapeake and Ohio Canal Company, and in the Baltimore and Ohio Railroad Company, of which he was a founder and a member of the first board of directors.

Contractor John Legg, on March 1, notified the board that he understood that Osborn "had taken the job for the completion of the Aqueduct at Monocacy in his name and mine." He had intended to go to Washington immediately to sign the contract with Osborn, but his personal business interests had detained him. By April 20 he would be able to appear in Washington, and he assured the board that they could reply upon his "engagement to sign the contract by that time" if he was "alive and well."[8]

On March 17 the board ordered that "two assessments made for work done on Aqueduct No. 2 by A. P. Osborn & Co. be paid although the contract for the work is not yet signed." The board also decided that 10 percent "only be deduced from all assessments made on that Aqueduct, no part of which percentage shall, however, be paid until the contract is completed."[9]

One week later Contractor Osborn requested from the board "an explanation of prices agreed upon for Aqueduct No. 2."[10]

Chief Engineer Wright, on April 14, notified Clement Smith, treasurer of the canal company, that Osborn was "expecting to have Mr. Cruger send on by a conveyance" his "estimate for labour done at the Aqueduct." After inspecting the construction site, Wright concluded that Osborn could "be safely paid from one thousand to twelve Hundred dollars." If Smith chose to advance that sum to Osborn, Wright promised to go to Harpers Ferry and persuade Engineer Cruger to sign a regular certificate, which would then be forwarded to the treasurer. Smith could then audit the certificate and retain out of the amount the advance percentage agreed upon.[11]

On April 22 Clerk Ingle informed Alfred Cruger, the recently-appointed resident engineer of the 5th residency, that Inspector of Masonry Leckie had resigned due to poor health. As a result, an agent was to be appointed "to attend to the distribution of lime from Shepherdstown and Tuscarora so as to ascertain where it is most needed and to supply it in sufficient quantities to several contractors." The cement mills on the Tuscarora were about to yield a considerable quantity, the kilns "being now on fire." The completion by Boteler and Reynolds of three new kilns on April 25 would enable them "to supply whatever lime we shall need." Accordingly, Cruger was to notify the masonry contractors "that they are required to give the boatmen written receipts for the lime delivered [to] them, without which the boatmen will be instructed not to deliver it." Because of Leckie's retirement, Cruger was to give his attention primarily to "a vigorous inspection" of the masonry works.[12]

Carroll was among those who resisted the condemnation efforts of the company in 1828-29. He brushed aside all offers for his lands in the Potomac Valley, stressing the great suffering which his tenants would experience during the actual construction. In return for this hardship to them, there was only the promise of increased land values for him if the canal were ever completed—which he doubted. However, the most important motive for his early resistance to the canal lay in his ties with the Baltimore and Ohio Railroad, which was at this time locked in a struggle with the canal company for the right of way in the Potomac Valley. See Robert G. Farris, *Signers of the Declaration of Independence* (Washington, D.C., 1973), pp. 43-44, 180-81, and Sanderlin, *Great National Project*, pp. 79-80.

[8] Legg to Board of Directors, Mar. 1, 1830, Ltrs. Recd., C & O Co.

[9] Proceedings of the President and Board of Directors, B, 45.

[10] *Ibid*., pp. 47-48.

[11] Wright to Smith, Apr. 14, 1830, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.

[12] Ingle to Cruger, Apr. 22, 1830, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.

Contractor Osborn, on April 28, reported to the board that he understood "by a friend that the general rumor is that I am in connection or partnership with Alfred Hovey." This information was incorrect, and, because Legg had not arrived by the date previously agreed upon, Osborn considered himself "one and alone." He assured the board that if the contract was declared to him he would not enter into partnership with either Hovey or Legg..[13]

On that same date the board referred several proposals for constructing Aqueduct No. 2 to Chief Engineer Wright for consideration. The board also directed Clerk Ingle "to invite proposals for the work" from Robert Leckie, the former inspector of masonry, and two contractors, Dr. Canfield and Robert Brown.[14]

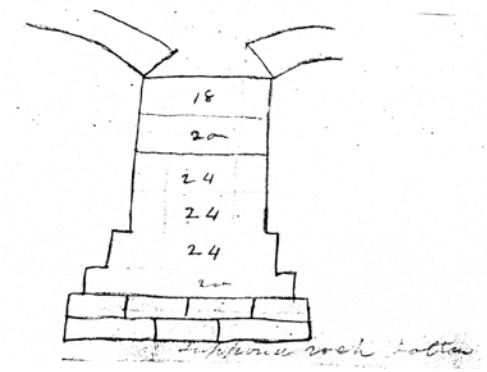
The board, on May 5, ordered that $1,000 be paid to Osborn & Co. for work on Aqueduct No. 2.[15]

On May 12 the various proposals for constructing Aqueduct No. 2 and the reports on them made by Chief Engineer Wright were referred to President Mercer, Treasurer Smith, and Peter Lenox, a member of the board.[16] One week later Smith reported to the board that the committee of three had concluded an agreement with Osborn.[17]

Chief Engineer Wright, on May 20, directed Osborn to get stone from the white quarry for the mitre for the piers and one abutment. In addition, the following courses were to be prepared for each pier and abutment:

3 courses of 24 inches thick each
1 course of 20 inches thick each
1 course of 18 inches thick each

These courses were exclusive of a 30-inch course that was to be laid at the bottom, and "it is agreed if they are not laid in the three piers," their place would be filled with "the white stone in the following manner":



[13] Osborn to Board of Directors, Apr. 28, 1830, Ltrs. Recd., C & O Co.
[14] Proceedings of the President and Board of Directors, B, 64.
[15] *Ibid*., p. 68.
[16] *Ibid*., p. 71.
[17] *Ibid*., pp. 73-74.

According to Wright this arrangement would "make the rough work which is under water rise so high that a 20-inch course will bring you to the top of the 30-inch [course] of the piers as now laid, and then the courses of 24 inches each and the one of 20 & 18 [inches] each will bring it up to the skewbacks." This work was to be done as soon as possible, and, if there was time, Osborn was to "prepare for putting down the present piers to the top of the 30-inch course and rebuild them with the white stone."[18]

On June 12 Osborn's assessment for Aqueduct No. 2, amounting to $2,298.74, was paid without deduction.[19]

The board, on June 16, notified Osborn that he was not to use the lime manufactured at Tuscarora Creek "for such parts of your work as may be exposed to danger from the use of inferior lime." Until coal could be procured for burning the stone, the directors would "require the exposed part of all the work [to] be laid in Shepherdstown or Roman Cement."[20]

On June 30, the board ordered "that each contractor shall boat his own water lime hereafter." According to the board, there was a good supply of cement at Shepherdstown, and the contractors would be sold "at reasonable prices any number of bags and boat covers."[21]

In July, Leckie and Cruger wrote an urgent note to the board reporting that the "work at the Monocacy Aqueduct is at present suspended, on account of the total want of Shepherdstown cement." Furthermore, after a careful inspection of the sets made from the Tuscarora cement, they were convinced that it was "very little, if any, inferior to the Shepherdstown cement." Accordingly, they had "instructed the persons now on the ground to recommence the manufacture without delay."

Five kilns had been constructed at Tuscarora Creek, and there were between 15,000 and 20,000 bushels of the raw materials used for making cement at the kilns. In addition, a large quantity of burnt and ground lime was being stored at the nearby mill. Although the cement could be burnt with wood, the two men felt that coal would be preferable. They felt that earlier specimens of cement that had been considered of poor quality by the board had been "under rather than over burnt."[22]

Chief Engineer Wright, on July 7, recommended to the board "that the three piers erected for the Aqueduct No. 2, of sand stone, be taken down, and be rebuilt of the granite from Johnson's quarry." The recommendation was adopted and the necessary instructions were forwarded to Osborn.[23]

---

[18] Wright to Osborn, May 20, 1830, Letter Book of the Resident Engineer of the 5th Residency of the 1st Division.
[19] Proceedings of the President and Board of Directors, B, 121.
[20] Ingle to Osborn, June 16, 1830, Ltrs. Sent, C & O Co.
[21] Ingle to Osborn, June 30, 1830, Ltrs. Sent, C & O Co.
[22] Leckie and Cruger to Board of Directors, July 1830, Ltrs. Recd., C & O Co. The only date placed on this letter was July 1830; thus a specific day cannot be definitely established.
[23] Proceedings of the President and Board of Directors, B, 135.

On July 24 Osborn requested an advance of money from the company for his work on Aqueduct No. 2. Chief Engineer Wright, on July 31, reported to the Board on Osborns's application, and the board "resolved that no advances will be made beyond the terms of the contract."[24]

On July 30, Alexander Van Alstine, a lawyer representing Hovey, informed the directors that his client desired to close "a settlement with the Board for what work he [had] done on this canal." Van Alstine hoped that the "long lingering affair will be finally closed without further delay."[25]

The following day the board ordered Clerk Ingle to "make out the accounts according to the terms of the contract." On the same date Osborn requested that an examination be made "into a supposed error in the final estimate on Aqueduct No. 2 to Hovey & Legg," which also affected his interests.[26]

At his request, Osborn, on August 7, was allowed by the board to assign his contract for Aqueduct No. 2 to Byrne and LeBaron of Pennsylvania. The new contractors were to be bound "in all respects" by the existing contract.[27]

One week later Osborn and Byrne and LeBaron, who proposed to take over Osborn's contract, jointly requested the board to extend the time allowed for completion of Aqueduct No. 2. The board accordingly extended the date to November 1, 1831, provided that "the contract be assigned to the said LeBaron, Burns [sic] & Co." [28]

Leckie, on August 14, resigned from his position of superintending the work on Aqueduct No. 2. He recommended that A. B. McFarland, a man in whom he had "full confidence in his mechanical knowledge, intelligence & integrity," be appointed to fill the vacancy.[29]

Three days later Attorney Van Alstine presented to the board a statement of the demands of Hovey and Legg against the canal company. The statement and supporting papers were referred to the chief engineer "to report thereon in strict conformity with the terms of the contract."[30]

A final estimate of work done by Osborn on the Monocacy Aqueduct was approved by the board on August 30. It therefore ordered that Osborn be paid the balance of $626.50.[31]

---

[24] *Ibid*., pp. 149, 153.
[25] Van Alstine to Board of Directors, July 30, 1830, Ltrs. Recd., C & O Co..
[26] Proceedings of the President and Board of Directors, B, 153, 155.
[27] *Ibid*., p. 157. The proper title for this company is confusing, because canal company records refer to it as "LeBaron, Byrne & Co.," "Byrne and LeBaron," and "Michael Byrne & Co." Because the title "Byrne and LeBaron" appears most often in the canal company documents, that designation will be used in this report.
[28] *Ibid*., p. 161. The exact date of the assignment of this contract to the company is uncertain, but available evidence shows that they began work about September 1.
[29] Leckie to Mercer, Aug. 14, 1830, Ltrs. Recd., C & O Co.
[30] Proceedings of the President and Board of Directors, B, 165-66.
[31] *Ibid*., p. 171.

III. BYRNE AND LEBARON COMPLETE THE AQUEDUCT

Although the firm of Byrne and LeBaron began work on Aqueduct No. 2 about September 1, there is virtually no documentary evidence on their first month of work. Instead, the available sources deal mainly with the controversy over the final settlement with Hovey And Legg.

Chief Engineer Wright, on September 22, wrote the board concerning his review of the claims by Hovey and Legg. From a strictly legal standpoint, he felt that they were not entitled to further payments. However, the board, upon his recommendation, had advanced $2,000 to Hovey in 1829 for "equitable claims he intended to make for operating quarries in various parts of the country, for transportation of stone further than the contract agreed to & some other items." In this respect, Wright wanted to know if the board considered the $2,000 an offset to 'these equitable claims." If they did, he would make a final estimate on the contract by "making the estimates of all labor & materials up to the time Mr. Hovey quit the work according to the scale as formerly laid down & acted under by Mr. Boyd."[1]

Attorney Van Alstine, on October 2, wrote the board chiding the directors for not giving their consent to Wright to "act upon all equitable claims in this case." In order to save the expense of litigation, Van Alstine proposed that the matter be submitted to the attorneys of both parties who would work out a final solution. However, he was eager for the board to give him the privilege of explaining to them "personally an amicable settlement" that could be effected without submitting the case I propose above."[2]

On October 16 Chief Engineer Wright made a final report to the board on the claims of Hovey and Legg. After examining the accounts of the contractors, the board concluded that no money was due them.[3]

Osborn, on October 11, asked the board "for the services of N. S. Roberts in affixing a value to certain property sold by him to Byrne & LeBaron at Aqueduct No. 2." The request was granted with the condition that Roberts would only spend a week on the project.[4]

A. B. McFarland, on October 9, reported to the board that Byrne and LeBaron "were of [the] opinion that by [their] contract the Canal Company were bound to deliver water lime to them at their works." To prevent delay from this misunderstanding, the board informed the contractors that the canal company "disclaim [ed] entirely, anything like obligation either expressed or implied to deliver cement at the work." Furthermore, the directors understood "from the words of the contract" that they were not "bound to furnish it anywhere." However, the board had directed Chief Engineer Wright "to report his opinion" as to whether the company was "bound to pay for

[1] Wright to Board of Directors, Sept. 22, 1830, Ltrs. Recd., C & O Co.
[2] Van Alstine to Board of Directors, Oct. 2, 1830, Ltrs. Recd., C & O Co.
[3] Proceedings of the President and Board of Directors, B, 203.
[4] *Ibid*., pp. 200-201.

the difference of transportation between Shepherdstown lime and that at the Tuscarora Mills now rejected as defective." If the quality of the Tuscarora lime was approved in the future, it would be used on the aqueduct, but until then the Shepherdstown lime would be required.[5]

A. B. McFarland, on October 11, was paid $60 by the board "for extra expenses incurred" in "directing the mode of manufacturing water lime at Tuscarora." The board also ordered "that $100 be advanced to him on account of his compensation as superintendent of Aqueduct No. 2 and other masonry."[6]

The firm of Byrne and LeBaron was paid $1,500 on October 11 for work done on Aqueduct No. 2 in September.[7]

On October 20 J. W. Reynolds, whose boats had been used for the transportation of cement from Shepherdstown to Aqueduct No. 2 appealed to the board for reimbursement for his services. After considerable difficulty he had succeeded in reaching a settlement with Byrne and LeBaron, who had promised to pay him in cash on October 10. When his agent had gone to get the money, the contractors had reneged on their promise and had given him an order on the canal company instead.[8]

President Mercer, on October 28, informed Byrne and LeBaron that it was "with extreme regret that I learn that no attempt has yet been made to recommence the masonry on the Monocacy Aqueduct." "Without this link in the chain of the canal above Seneca," Mercer saw no hope "of bringing the aqueduct into use or the canal above or below it, since apart from the Potomac there is no feeder that could be resorted to but the Tuscarora which is above Monocacy." Because of the importance of this structure, he wanted to know the causes of their past unexpected delays and their "candid opinions of the time at which this work will be so far completed, as to pass the canal boats through it."[9]

Thomas F. Purcell, the resident engineer on the 1st Residency, reported to Mercer on October 29 that domestic hydraulic cement should not be used for the face work of any lock or aqueduct. From his observations on the Erie, Pennsylvania, and Chesapeake and Delaware canals, he had found that the cement, similar to that produced at Shepherdstown, yielded to the friction of running water. The compactness of the cement when set was deceptive and induced "reliance on its use as a cement." Although hydraulic cement was preferable in instances where a simple bond between stones was desired, its exposure to running water would cause it to "yield and gradually decay." Accordingly, he recommended the use of Roman Cement on all parts of the locks and aqueducts that would be exposed to running water.[10]

---

[5] Ingle to Byrnes and LeBaron, Oct. 11, 1830, Ltrs. Sent, C & O Co. See also Proceedings of the President and Board of Directors, B, 197.
[6] Proceedings of the President and Board of Directors, B, 201.
[7] *Ibid.*
[8] Reynolds to Ingle, Oct. 20, 1830, Ltrs. Recd., C & O Co. The sum, which could not be determined from available sources, was immediately paid by the company.
[9] Mercer to Byrnes and LeBaron, Oct. 28, 1830, Ltrs. Sent, C & O Co.
[10] Purcell to Mercer, Oct. 29, 1830, Ltrs. Recd., C & O Co.

At the board meeting on December 4 it was announced that the marshall of the District of Columbia had issued a summons for the president and directors of the company to appear in court regarding a suit brought against them by Asher P. Osborn. The board directed Attorney Richard S. Coxe "to appear for the company" and to recommend to Osborn an immediate trial of the case.[11]

Inspector of Masonry McFarland, on December 7, sent a letter to President Mercer telling him that 4 inches of snow had fallen at the mouth of the Monocacy. This threatened to halt the attempt to raise all the piers on Aqueduct No. 2 before the onset of winter. Although this was a disappointment, he felt when spring came the progress of construction could be "so driven" as "to overtake the other departments of the work before the final completion of the building." The time necessary for the construction "of walls from well cut ashlar" was "but a small item compared with the time required for quarrying, cutting and drawing." Consequently, he was convinced that "all the arches of this Aqueduct" could be finished by July 20, 1831.[12]

Engineer Cruger, on January 4, 1831, reported to the board that Byrne and LeBaron were "desirous of constructing a road from Johnson's quarry to the aqueduct for the transportation of their stone." However, the contractors "could not agree with the owners of the land over which it was proposed to construct the road for the right of doing so." Accordingly, the board authorized President Mercer "to cause a jury to be summoned for the purpose of condemning the right of way, the expense thereof to be charged to Byrne & Co."[13]

On January 14 Cruger submitted a report to President Mercer regarding "an estimate of the force necessary to complete the aqueduct by the 1st of Novr. next in all the various occupations of cutting, quarrying, transporting & laying." Cruger reported that at the present time there were 3 feet of snow on the ground, which had stopped the quarrying, and cutting operations. The contractors, however, had constructed a number of sleighs on which they could "transport their material almost as economically as upon a rail-road, owing to the bad condition of the roads lately." Although much quarried and cut stone had accumulated at the quarry at the base of Sugarloaf Mountain, Cruger expected that the contractors would be able to haul "all the stone on the ground before the snow melts."

Cruger also reported that he had obtained permission from several landowners to construct a railroad through their lands under certain conditions. According to Cruger, the contractors would be satisfied with any arrangements made by the company, and they were willing "to have the sums paid to each [of the proprietors] deducted from their estimates, which is the only mode of payment the proprietors will consent to."

Byrne and LeBaron had already made a contract with "individuals for the construction of this railroad to be completed in 40 working days." When the railroad was completed, it would, in Cruger's opinion, advance the work 3 months. During the early winter, the contractors had received all "their machines, tools and implements from Pennsylvania," where they had "just completed nearly as large a work across the Conimaugh." Since that time they had made "such prep-

[11] Proceedings of the President and Board of Directors, B, 242.
[12] McFarland to Mercer, Dec. 7, 1830, Ltrs. Recd., C & O Co.
[13] Proceedings of the President and Board of Directors, B, 251.

arations as will enable them to make sufficient progress in the spring to more than compensate for the delay of last fall."

In order to finish the construction of Aqueduct No. 2 by the following November, Crugeer estimated that the following force should be regularly employed:

60	men quarrying at the white quarry
100	men cutting the white stone
13	four-horse tems transporting the white stone
33	masons, including tenders with a complement of teams, drivers &c, in addition
2	four-horse teams hauling cement
1	boat and 5 men transporting sand
10	men procuring backing
10	carpenters
233	Total number of men[14]

On March 18 Engineer Cruger reported to the board that agreements had been made with J. J. Harding and Mrs. J. F. Byrd for the right of constructing a temporary railroad across their lands from the stone quarry at the base of Sugarloaf Mountain to Aqueduct No. 2. The board approved the agreements and ordered the payments to be charged to Byrne and LeBaron. On that date a payment of $100 was made to J. J. Harding.[15]

At the same board meeting, Cruger, in behalf of Byrne and LeBaron, asked the directors to purchase two scows belonging to the company. Accordingly, the board ordered that the scows could "be sold for their first cost, deducting the value of any damages which they may have sustained since they were owned by the Company" provided the "Superintendent of the Canal shall be of opinion that they can be dispensed with by the Company."[16]

The board, on June 6, notified the stockholders that:

> The aqueduct of seven arches, of fifty-four feet span each, across the Monocacy, has been three times let, the contract for its construction having been once abandoned, and once transferred by assignment. It is now in the hands of an efficient contractor, who by the terms of his agreement, is allowed til [sic] November next for its construction. The red free stone first chosen for this work having proved defective, it required to be built of a white granite; for the transportation of which, the contractor has found it necessary to construct a railway exceeding two miles in length. This stone is quarried with facility, but it is so hard as to require great labor to cut it, and the contractor has experienced delays, from various accidents, not the least formidable of which, was the bad state of the road from the river to the quarry, which drove him finally to the construction of the railway, and the frequent freshets of both

[14] Cruger to Mercer, Jan. 18, 1831, Ltrs. Recd., C & O Co.
[15] Proceedings of the President and Board of Directors, B, 283. A thorough search of Record Group 79 in the National Archives has failed to turn up any information regarding the construction of the temporary railroad. However, T. H. S. Boyd, in his *History of Montgomery County, Maryland, From Its Earliest Settlement in 1650 to 1879*, provides a good description of this railroad, which may be seen in Appendix C.
[16] Proceedings of the President and Board of Directors, B, 283.

> the Potomac and the Monocacy, which have since often arrested the progress of his masonry. The foundations of the piers are laid and secured to the rocks on which they stand; the abutments and several of the piers are ready for the centers, one of which is up, and the arch now turning upon it. A doubt notwithstanding exists, that unless the ensuing Autumn shall prove more healthy than the last, this work will not be ready for the admission of the water through it before the end of next Spring. That it will be then finished is confidently expected.[17]

In June an examination of the canal was made by two "skilled engineers of the topographical corps of the army, by order of the President of the United States, at the request of the president and directors" of the canal company.[18] Lieutenant Colonels John J. Abert and James Kearney made the survey, reporting favorably in detail on the type of construction of the various structures. These two officers made the following observations on Aqueduct No. 2 in their report submitted on June 13:

> The next object of our examination was the aqueduct over the Great Monocacy. This structure is 438 feet long from the face of one abutment to the face of the other, and the masonry of the abutments and wing-walls extends ninety-six feet further. The whole work will consist of two abutments, six piers, and seven arches. The masonry of the abutments and piers rests upon the solid rock which forms the bed of the river, and which had been previously cleaned and prepared for the purpose.
>
> The arches are to be fifty-four feet in the span, with a rise of nine feet. The two arches, which rest against the abutments, are conducted, within the abutments, by what is called a blind arch, down to the rock foundation. The centering of one arch is up, the masonry partly laid, and preparations were in activity for erecting other centers.
>
> The piers and abutments are thirty-three feet four inches long, exclusive of the pilasters. The piers are ten feet wide above the water table, and fourteen feet wide, and thirty-eight feet long at the foundations, which last dimensions are preserved up to within one foot of the low water surface.
>
> These piers (except one) and the abutments are now erected, and nearly in a condition to receive the skewbacks.
>
> When the masonry is brought up to the point before stated, an offset is constructed entirely around each pier and the faces of the abutments, after which the range work with hammered faces commences.
>
> The first course of range work is twenty-six inches high, and reduces the abutments to thirty-three feet four inches long, and eleven feet thick. The second is twenty-four inches high, preserves the same length to the abutment, but reduces its thickness to ten feet. There are then three additional courses, one of twenty-two inches, one of twenty inches, and one of eighteen inches high, which brings the piers and abutments to the desired elevation for receiving the spring stone or skewbacks of the arch. The work of these piers and abutments is a system of

[17] Third Annual Report (1831), C & O Co., in Proceedings of the Stockholders, A, 134-35.
[18] Proceedings of the President and Board of Directors, B, 311, 318-19.

> headers and stretchers, except the interior or backing, which is composed of rubble stone. The stretchers are four feet long, and none are admitted with a less width of bed than two feet. The headers have a front two feet long, and have to extend not less than five feet into the masonry. Their beds are all cut so as to be parallel. This range work is laid in cement or hydraulic mortar, and the interior or backing carefully grouted with the same material.
>
> The ringstones of the arches are cut by a pattern furnished to the contractor, and are to extend into the masonry three feet, and five feet alternately. The depths of these stones are so arranged as to be three feet at the spring of the arch, and to decline gradually to two feet six inches at the crown.
>
> The sheeting stone are also cut to the same angles as the ringstones, and to range well with them.
>
> The whole of the arch masonry is also to be laid in hydraulic mortar, and the entire extrados of the arch is then to be carefully grouted.
>
> The canal passage is to be eighteen feet six inches wide at the bottom, and nineteen feet six inches at the water surface, with a depth of six feet.
>
> The work, when completed, is to be surmounted by an iron balustrade.
>
> Mr. Cruger, the resident engineer, showed to us also the specifications of this work, (which form a part of the contract with the builder,) describing the manner in which it was to be executed, and the dimensions of its various parts. We observed, at the foot of these specifications, the name of the celebrated civil engineer, Judge Wright, who was formerly in the employ of the company.
>
> A temporary railroad has been constructed to the quarry, from which the stone for this work is obtained, and which is situated about three miles back from the river. We visited the quarries. The stone lies high, and is of easy access; its color a dull white. It is of the kind usually called by workmen mountain granite, but by geologists it would be called a gray wacke. It splits well, hammers without fracture, is fine grained, and in our opinion, a very lasting stone.
>
> The work was executing in good faith by the contractor, and was vigilantly watched and inspected by the engineer. We consider the plan judicious, as well as its execution, in which are united the true principles of economy, usefulness, and durability.[19]

Engineer Cruger, on June 17, notified the board that Byrne and LeBaron had threatened to abandon their contract for Aqueduct No. 2 because the prices allowed them by their contract were less than the actual cost of their work. Accordingly, Cruger recommended an additional allow-

---

[19] *Report of Col. John J. Abert and Col. James Kearney of the United States Topographical Engineers, upon an Examination of the Chesapeake and Ohio Canal from Washington City to "Point of Rocks"* (Washington, 1831), reprinted in *Chesapeake and Ohio Canal: Report to Accompany H.R. 94*, 23d Cong., 1st sess., 1834, H. Doc. 414, p. 91. A thorough search of Record Group 79 in the National Archives has failed to turn up the specifications for Aqueduct No. 2

ance to the contractors for quarrying and cutting the stone for the aqueduct. After considering Cruger's proposal, the board suspended its earlier "order prohibiting an increase of contract prices above Seneca, so far as it relates to Aquedauct No. 2." The directors ordered that "in addition to the present contract prices for Aqueduct No. 2, there be paid to the contractors for so much of the following described stone as remained to be quarried and cut on the1st day of the present month:

For quarrying ashlar	15 cents per foot
For cutting the same	5 cents per foot
For quarrying sheeting	23 cents per foot
For cutting the same	10 cents per foot
For quarrying coping	11 cents per foot

These price increases were subject to three conditions. The contractors were to convey to the canal company "all their right and interest in and to the rail-road constructed by them from the stone quarry to the aqueduct, reserving only the right to use the same, until their works on the aqueduct shall be ended." Any reasonable difference in the expense that the contractors incurred in "procuring cement from Shepherdstown, over and above the cost of that procured from the Tuscarora" was to be allowed them in the final settlement. Finally, the contractors would be required to increase the force employed on the aqueduct to the extent Resident Engineer Cruger thought proper.[20]

Inspector of Masonry A. B. McFarland, on August 28, informed the board that "the operations of quarrying and cutting at the Monocacy quarries are progressing with considerable energy." About 70 workmen were still engaged in quarrying, although some of them were sick with cholera. Because the epidemic had spread all along the line of construction, most of the operations had been temporarily suspended. To assist in the quarrying, Byrne and LeBaron had made a subcontract with John Hay, a mechanic of the culvert contractors, to quarry and cut sheeting stone for the aqueduct.

During the summer Boteler and Reynolds had sent several cargoes of cement from Shepherdstown to Aqueduct No. 2. Because no provision had been made for paying for this cement, McFarland, on August 28, desired instructions from the board on how to proceed.[21]

On November 17 McFarland wrote to the board complaining that the contractors on the culverts had waited until near the end of the building season to "commence several of the arches which cannot be expected to be completed before they are overtaken with the frosts of winter." The character of the masonry was "such that any exposure of this kind may reasonably be expected to cause accidents after the introduction of water into the canal." To speed up their projects, the culvert contractors were "diverting mechanics from the Monocacy Aqueduct, the arches of which we are compelled to close before winter if possible to effect it by any combination of forces that can be applied." Work on the aqueduct had advanced to the fourth arch, one-fourth of which remained to be finished. The centers were already placed and work nearly ready to begin on the fifth arch, leaving only two arches to be completed. A failure in the accomplishment of

[20] Proceedings of the President and Board of Directors, B, 388-89.
[21] McFarland to Ingle, Aug. 28, 1831, Ltrs. Recd., C & O Co.

this goal would, according to McFarland, "greatly endanger that part of the work already finished."

Because workmen in the Potomac Valley were extremely scarce, McFarland felt that the operations on the culverts should be stopped "at the first visible signs of frost." Most of the culverts, in his estimation, would "be hard pressed to have their abutments and wing walls ready, even with a view to closing the arches in the spring."

Because the culvert contractors were interfering with progress on the Monocacy Aqueduct, McFarland desired instructions from the board on what should be done. In the event of severe frost, the position of the sheeting on the aqueduct was "such as to admit the grout freely after the arch is closed, and if found expedient in the 2 last arches, the introduction of this fluid mortar" could be suspended until the opening of spring. On the other hand, the culvert arches were "extremely light & thin rubble masonry, which must necessarily be laid in mortar." The action of the frost both "on the soffits & extrados would destroy the setting properties of the cement entirely."[22]

Engineer Cruger, on November 25, sent a letter to President Mercer reporting on "the very feeble force employed on the Aqueduct [No. 2]." The structure, "for want of additional centers in the first instance, and an adequate force to use them to advantage," had been "wantonly exposed to the hazard of destruction, so far as it is done, by the winter ice and freshets."[23]

On December 24 the resident engineers of the 1st and 2nd residencies submitted to the board drawings and cost estimates "for railing for Aqueducts No. 1 & 2." The plan for the railing of the Monocacy Aqueduct provided for "stone posts and chains." The plan approved for the railing of the Seneca Aqueduct provided that wrought iron be substituted for the stone posts in the Monocacy plan.[24]

Inspector of Masonry McFarland, on January 18, 1832, notified President Mercer that the Monocacy River had "fallen very much" in the past 24 hours. He was happy to report that "the sheeting [stones] which fell from the 5th set of centers are not much damaged," because "the force must have been arrested by the thickness of the ice." If the weather continued fair, he recommended that the centers for the fifth and sixth arches be raised. The quarrying and stonecutting for the aqueduct were proceeding with little delay. About 50 workmen were employed at the quarries, and the number of laborers seemed to be increasing.[25]

On January 21 McFarland proposed a series of modifications in the specifications for the aqueducts, locks, and culverts on the canal. Regarding the aqueducts, he recommended the following changes:

---

[22] McFarland to Board of Directors, Nov. 17, 1831, Ltrs. Recd., C & O Co.
[23] Cruger to Mercer, Nov. 25, 1831, Ltrs. Recd., C & O Co.
[24] Proceedings of the President and Board of Directors, C, 43-44. The chains and railing were to be placed only on the towpath side of the aqueducts.
[25] McFarland to Mercer, Jan. 18, 1832, Ltrs. Recd., C & O Co.

> Backing stones for piers of cut masonry, where paid for as such, should be squared or well scabbled to form close joints, and of equal thickness with the front courses, so as to admit of no small rubbish for filling in, and the headers or bond stones in work of this character should be perfectly parallel in their beds so as to hold the same thickness in rear as in front.
>
> The sheeting of arches where cut and paid for as such, should be well scabbled at the ends so as to fill the square the whole width of the stone from the soffit to the extrados; in other respects, the old specifications are perfect enough, but the end joints of nearly all of the sheeting first prepared for the Monocacy Aqueduct were not squared any better than common ashlar—12 to 16 inches instead of three feet, the width required.

Cement for the arches of all the masonry works was to "be put up into air tight barrels." The "delicacy" of the cement was such that it tended to lose "its best properties so long as the present method is pursued of securing it into imperfect lime houses."[26]

On March 29 Charles H. LeBaron submitted a bid to the board for the handrail across Aqueducts Nos. 1 and 2. His proposed prices were as follows:

For Seneca	railing (lead)	13 cents per pound
	stone posts	$6 each
For Monocacy	chain	14 cents per foot[27]

Two days later the board accepted the proposal of Gideon Davis "for the railing for Aqueduct No. 1 and for the chain to be used as a railing on Aqueduct No. 2." The contract provided for the substitution of "2 chains of ½ inch iron for 3 chains of smaller iron as heretofore adopted."[28]

McFarland, on March 31, notified the board that the masonry works between Seneca and Point of Rocks were "much retarded in their progress for the want of cement." Because the Potomac Mills were temporarily closed for repairs, he urged the board to use New York cement "provided it can be obtained at this place [Washington] at reasonable rates and pass through the Canal free of toll." At this time there were 13 culverts, 2 locks, and the Monocacy Aqueduct under construction on this stretch of the canal and badly in need of cement.[29]

The scarcity of cement was still a problem between Seneca and Point of Rocks on April 28 when McFarland wrote to President Mercer:

> The Monocacy Aqueduct . . . has advanced to the last arch, the centers of which are about to be raised, and all the spandrels of other arches are raised level with their crowns, answering to the level for laying the watertable, but unfortunately there is no cement [although] the forces of workmen are at this time quite ample.[30]

---

[26] McFarland to Ingle, Jan. 21, 1832, Ltrs. Recd., C & O Co.
[27] LeBaron to Mercer, Mar. 29, 1832, Ltrs. Recd., C & O Co.
[28] Proceedings of the President and Board of Directors, C, 118. A thorough search of Record Group 79 failed to turn up more detailed information or the drawings of the railings for Aqueducts Nos. 1 and 2.
[29] McFarland to Board of Directors, Mar. 31, 1832, Ltrs. Recd., C & O Co.
[30] McFarland to Mercer, Apr. 28, 1832, Ltrs. Recd., C & O Co.

On June 1 the board announced to the stockholders that

> The various works on the canal, between the Point of Rocks and the basin in Georgetown, which had been permitted to proceed, very tardily for many months, in consequence of their utter inutility without a supply of water, and the remoteness of that supply, in point of time, have, notwithstanding, reached very near their final completion. The Monocacy Aqueduct, a work of very solid structure and necessarily of great cost, withstood the extraordinary ice freshets of the last winter and spring, notwithstanding the center of one of its arches was swept away, and the ring stone and sheeting of the adjacent arch left without any lateral support except from the adjacent pier.
>
> All the arches are now closed, and the whole work in such progress, as to leave no doubt of its completion before the water can be admitted from above.[31]

The board, on June 5, ordered that an iron railing "be adopted for Aqueduct No. 2, in lieu of the chain as proposed." Gideon Davis was to receive the same price per pound for this railing as he had contracted for on Aqueduct No. 1.[32]

Clerk Ingle, on July 7, informed the board that "judgment had been obtained against the Canal Company by A. P. Osborn for $279.63 on Aqueduct No. 2, and $3,074.30 on Sections 13 and 14." Accordingly, the board ordered that the judgments be paid.[33]

As construction on the Monocacy Aqueduct and other masonry works lagged in the late summer and early autumn months, President Mercer, on November 3, wrote to Byrne and LeBaron chiding them for neglecting their agreements with the company. The board had taken measures that day that were "designed to provide for the immediate completion of the works below the head of Harper's ferry falls," which embraced "among other subjects the Monocacy Aqueduct in the completion of which so much indulgence has already been extended." During his recent visit to the north, he had found stonemasons both in Pennsylvania and New Jersey "in numbers quite sufficient to render any longer delay of the Monocacy Aqueduct wholly inexcusable." If reports of further delay on this structure reached him, he would "be compelled to pursue the course pointed out to me, by my duty, which will be to declare your contracts abandoned, & to place its works in other hands."[34]

When construction on the line of canal above Harpers Ferry began in the fall, rumors reached the engineers that the board had determined to construct certain parts of the work in a different manner than that which had been estimated. On November 3 Mercer informed Resident Engineer Thomas F. Purcell that most of these rumors were incorrect. However, the board had decided that Aqueduct No. 5 be built with "a flooring of brick laid in water lime for one of plank, which I regret that we have made on the Monocacy Aqueduct, a work in all other respects of the most desirable construction."[35]

---

[31] Fourth Annual Report (1832), C & O Co., in Proceedings of the Stockholders, A, 224.
[32] Proceedings of the President and Board of Directors, C, 163.
[33] *Ibid*., p. 185.
[34] Mercer to Byrnes and LeBaron, Nov. 3, 1832, Ltrs. Sent, C & O Co..
[35] Mercer to Purcell, Nov. 3, 1832, Ltrs. Sent, C & O Co.

Two days later, Inspector of Masonry McFarland complained to Mercer that the shortage of cement along the canal had brought work to a virtual standstill. The quantity of Shepherdstown cement required for the masonry just begun above Harpers Ferry was lessening the amount available for the works below. No cement had been procured for the Monocacy Aqueduct during the past week, halting operations on that structure.[36]

The board, on December 1, ordered that $5,000 be paid to Byrne and LeBaron "to be charged to them in a final account."[37]

On Christmas Day Engineer Cruger submitted a report on the amount of cement still needed to complete the masonry works on the 3rd Residency. For Aqueduct No. 2, 1,500 bushels were still needed, the majority of which was to be supplied from the Tuscarora mill. The total number of bushels required to finish the masonry works between Section No. 66 and Lock No. 37 was estimated at 52,300.[38]

On January 17, 1833, Cruger presented a certificate to the board stating "that 5,000 [dollars] might with safety be paid to Byrne & LeBaron on account of Aqueduct No. 2." Accordingly, the board ordered that this sum be paid. Walter Smith, a member of the board, opposed the payment and "desired that his vote against the adoption of this order should be recorded."[39]

The board, on March 23, advanced $150 to Contractor Gideon Davis "on account of the iron railing for Aqueduct No. 2."[40]

By April 1 construction work on Aqueduct No. 2 had been completed. A final estimate of $4,473.48 for constructing the wing walls of the aqueduct was paid to the contractors.[41] On April 20 the sum of $126 was charged to Byrne and LeBaron for 600 bushels of cement, which earlier had been transferred to them from the supply of Contractor James Melville.[42] The final estimate by the contractors for the work done on the aqueduct was approved on May 24 by the board, which "ordered that the sum of $6000 be paid on account of the balance appearing to be due thereon."[43] The following month, on June 17, the board directed that $540 be paid to Byrne and LeBaron "for the sand and the railroad comprehended in the Engineer's estimate."[44]

William S. Elgin, the superintendent of the canal, reported to the board on July 10 that there was "a regular travel of all kinds of carriages on the towing path of the canal." Carriages were also crossing the Monocacy Aqueduct, which was too narrow for their passage, causing the hubs of

---

[36] McFarland to Mercer, Nov. 5, 1832, Ltrs. Recd., C & O Co.
[37] Proceedings of the President and Board of Directors, C,. 247. Available evidence does not indicate the circumstances under which this payment was made.
[38] Cruger to Mercer, Dec. 25, 1832, Ltrs. Recd., C & O Co.
[39] Proceedings of the President and Board of Directors, C, 266. On February 23 another sum of $5,000 was paid to the contractors for work done on Aqueduct No. 2.
[40] *Ibid*., p. 307.
[41] *Ibid*., p. 317.
[42] *Ibid*., p. 323. This shipment of cement was the last to be sent to Aqueduct No. 2.
[43] *Ibid*., p. 354.
[44] *Ibid*., p. 388. Four days later a final estimate was taken on the railings of Aqueduct Nos. 1 and 2, and Contractor Gideon Davis was paid $1,282.17.

the carriage wheels to rub the railing. In order to prevent this traffic, he recommended that the board authorize him to fine any vehicles traveling on the towpath and aqueduct.[45]

At their next board meeting, on July 19, the directors considered various alternatives for dealing with this problem. Accordingly, they ordered "that posts be placed on the towpath to prevent carriages from getting on the aqueducts."[46]

The board, on August 2, took up the accounts of Byrne and LeBaron "for adjustment and in the spirit of compromise." The directors agreed to "reduce the charge for the services of the Superintendent employed by the Company according to the terms of the contract" and also "for quarry rent to $600."[47]

Water was admitted into the canal at Harpers Ferry during the last weeks of October. On November 1 Engineer Cruger sent the following report to the board from Seneca:

> There is four feet [of] water from Harpers ferry to the 1st Lock below the Monocacy, and navigable water thence to the Beaver Dam Culvert, and the water is coming on rapidly to Seneca; it will reach here by 12 o'clock today. There is no leak or appearance of break on the whole line; the manner in which the canal holds water is a subject of admiration to all those who are witnessing it.[48]

On December 1 Captain William G. McNeill of the U.S. Topographical Engineers submitted a report to the board on the condition of the canal. His examination of the waterway had been undertaken "by order of the Secretary of the Treasury, at the request of the President and Directors" of the canal company. Concerning Aqueduct No. 2, the report stated:

> Aqueduct No. 2, over the Monocacy River, built of a white granite stone, of excellent quality, obtained from quarries within 8 miles of the site, is 438 feet in length between the abutments, and 516 feet from end to end of the wing walls, which project from them. There are 7 arches of 54 feet span each, and 9 feet rise, (segments of a circle,) the radius of the intradors [sic] of which is 45 feet.
>
> It has in fact been constructed in the manner proposed, as described in the report of Colonels A. [Abert] and K. [Kearney], and containing 9,788 perches of masonry, (exclusive of the rough walls in which the cut masonry of the wings terminates,) has cost the sum of $125,000.
>
> There are in this aqueduct 25,500 superficial feet of cut ashlar: 11,000 superficial feet of coping: 10,500 superficial feet of sheeting, measuring the intradors [sic] only, and rather more than 1,000 lineal feet of water table: in all constituting a work which, while it is highly orna-

[45] Elgin to Board of Directors, July 10, 1833, Ltrs. Recd., C & O Co.
[46] Proceedings of the President and Board of Directors, C, 401.
[47] *Ibid*., p. 406.
[48] Cruger to Board of Directors, Nov. 1, 1833, Ltrs. Recd., C & O Co.

> mental, unites, (in the words of Colonel A. and K.) both in its plan and execution, "the true principles of economy, usefulness, and durability.[49]

On December 6 the board ordered "that the sum of $100 standing to the credit of M. Byrne & Co. on the books of the company on account of Aqueduct No. 2 be paid."[50] When this final payment was made to the contractors, the account for the construction of Aqueduct No. 2 was closed. All told, the company had paid out $127,895.51 to the three contractors in securing the completion of Aqueduct No. 2.[51]

[49] *Report of Captain Wm. G. McNeill on the Condition of the Chesapeake and Ohio Canal* (Boston, 1833), reprinted in House Report 414, p. 144.
[50] Proceedings of the President and Board of Directors, D, 27.
[51] Ledger A (1828-1841), C & O Co.

IV. THE MONOCACY AQUEDUCT FROM 1834 TO 1950

When the canal was rewatered in early March 1834, an unexpected leak at the Monocacy Aqueduct occurred, delaying full use of the canal for 3 days. No damage was done to the structure itself, but the back of one of the abutments was repuddled. To make the aqueduct "perfectly secure," Charles B. Fisk, the new chief engineer of the canal company, recommended that several weeks of work would need to be done. Because the structure could be considered secure as long as the water was kept in the canal, Fisk felt that this work could be postponed until the following winter.[1]

At the seventh annual meeting of the canal company in June 1835, the board reported to the stockholders:

> The masonry is admitted by all who have had the opportunity of judging, to be equal to any on similar works, either in this country or Europe. . . .
>
> Aqueduct No. 2, over the Monocacy River, is a very splendid work, built of a superior granite stone, resembling white marble. It is 516 feet from end to end of the wing walls, resting on seven arches of 54 feet span each.[2]

Superintendent William S. Elgin, on November 23, 1836, informed the board that there was "a breach in the embankment upon one of the wings of the Monocacy Aqueduct." To remedy this problem, Elgin recommended that a stop gate be located on that level of the canal. Accordingly, the board ordered Chief Engineer Fisk "to locate a stop gate as recommended, and if it be deemed expedient to construct it near to Nolands ferry to connect with it a Pivot Bridge leading from that ferry."[3]

On January 4, 1837, Fisk wrote to the board stating "that it may not be necessary at this time to construct the Lock & Bridge if a waste weir be constructed near to the foot of Lock No. 28 and a double sett [sic] of stop plank be provided for the Monocacy Aqueduct and put in charge of the Keeper of Locks No. 27." After considering these suggestions, the board instructed Elgin to construct a waste weir "near to the foot of Lock No. 28" and also to secure stop planks "as recommended by C. B. Fisk."[4]

Superintendent Elgin, on May 25, 1838, notified Assistant Engineer Joshua Gore that he had been asked by Fisk to make "some measurements of [the] Aqueduct No. 2 railing." His findings were as follows:

---

[1] Fisk to Ingle, Mar. 8, 1834, Ltrs. Recd., C & O Co.
[2] *Seventh Annual Report* (1835), C & O Co., pp. 4-5.
[3] Proceedings of the President and Board of Directors, E, 172.
[4] *Ibid*., pp. 188-89. This work became more urgent when, on January 25, a second breach in the embankment of Aqueduct No. 2 was reported by Elgin.

> I find between each of these larger bars 10 ft. 8 in., these large bars 1-1/2 inches square with a brace of 1 inch square. There are 15 small bars of ¾ in rolled iron and eight inches from center to center of each; the length of these bars is 3 feet 7-1/2 inches, 3 ft. 1 inch from coping to rail and 5-3/4 in. above the rail. The large bars have cast knobs that project about 3 inches above the smaller bars. The rail is 2-1/2 by ¾ inches.[5]

Aqueduct No. 2 was giving good service in June 1853 when Thomas L. Patterson, the newly-appointed chief engineer, reported that all the "aqueducts are in good condition and require no repairs."[6]

At a meeting of the board on June 26, 1856, General Superintendent A. K. Stake reported that

> directions had been given to the Supts. of Divisions to have a cheap railing placed upon the inner edge of the coping of the several aqueducts on the line, which had been carried out upon most of the Divisions, & arrangements made to carry out upon all of them; that it is a great improvement, both in appearance, and security to the passing teams &c.[7]

During the Civil War, the area around the mouth of the Monocacy River became a theater of active military operations. In early September 1862 General Robert E. Lee determined to take the war north of the Potomac after his successful engagement with the Union troops at the Second Battle of Manassas. Major General D. H. Hill, with two brigades deployed in line of battle, approached the Potomac at White's Ford on September 4. This crossing of the Potomac and the nearby Monocacy Aqueduct was guarded by men of the 1st Potomac Home Guard Regiment and the 87th Ohio. The Union pickets fled, and Hill's combat-ready veterans waded the Potomac. By nightfall Hill's men, almost without firing a shot, had established a bridgehead. Before permitting his troops to encamp, Hill turned out a detail charged with the task of putting a stop to traffic on the canal.[8]

Although the Potomac at this season was no obstacle to the army, the canal was. Near Aqueduct No. 2 the waterway could be crossed by several pivot bridges and underpassed by the White's Ford Culvert. These would turn into bottlenecks for the troops, so General Hill had a fatigue party wreck the Little Monocacy Culvert and drain the 7-mile level. The berm and towpath banks were cut down, the waterway corduroyed, and the artillery and trains moved across.[9]

Men from Hill's Division charged with wrecking key canal structures in the area remained at work while Jackson's Corps forded the Potomac the next day. Thomas Walter was the tender at Lock No. 27 and was one of the men Captain R. C. Bomford of the Union army believed to be disloyal. When Walter saw that Hill's people were intent on wrecking his lock and the Monocacy Aqueduct, he pleaded with Hill not to destroy the structure. If the Confederates intended to stop navigation on the waterway, he suggested that they cut down the banks rather than blow up the

---

[5] Elgin to Gore, May 25, 1838, Ltrs. Recd., Chief Engineer.
[6] *Twenty-Fifth Annual Report* (1853), C & O Co., p. 9.
[7] Proceedings of the President and Board of Directors, I, 274.
[8] Edwin C. Bearss, "1862 Brings Hard Times to the Chesapeake and Ohio Canal," *West Virginia History* 30 (January 1969): 448-49.
[9] *Ibid*., p. 449.

aqueduct and lock. General Hill disagreed, and for a while the discussion between the general and lock keeper became so heated that bystanders feared that Walter would be arrested.[10]

Hill, on checking with his chiefs of ordnance and engineers, learned that in the division there were not enough tools or spare powder to insure the destruction of the Monocacy Aqueduct, so he ordered his demolition team to concentrate on Lock No. 27. A hole was drilled into the masonry of the lock and a charge of powder placed and detonated. Having wrecked this lock and burned a few canal boats trapped on the 7-mile level, Hill recalled his troops on the evening of September 5 and marched northward to Harpers Ferry.[11]

As part of Lee's plan to eliminate the strong force under Colonel Dixon Miles that was holding the Harpers Ferry-Martinsburg area, Major General John G. Walker's Division was to destroy the Monocacy Aqueduct, recross the Potomac at Cheek's Ford, and occupy Loudoun Heights. Walker's Division reached the mouth of the Monocacy River about midnight on September 9. The 24th North Carolina had the advance and found Union pickets holding the aqueduct. Shots were exchanged, and the union pickets fled, after having wounded Captain G. T. Duffy of the North Carolina Regiment. Walker organized fatigue details, tools were passed out, and men were put to work drilling holes for placing charges to wreck the seven arches. After several hours, Walker's chief engineer complained that the drills were extremely dull, while the masonry was possessed of "extraordinary solidity and massiveness." To demolish the aqueduct would require days not hours. In view of Lee's plan, this would be impossible, and the fatigue parties were recalled.[12]

Early on September 10 a Union force surprised the Confederates under Walker by moving into the area before dawn, taking possession of the aqueduct, and placing artillery commanding the approaches to that structure and Cheek's Ford. Accordingly, Walker recrossed the Potomac at Point of Rocks that night, though with great difficulty because of the destruction of the pivot bridge over the canal at Lock No. 28 and the steepness of the riverbanks.[13]

On October 9 Superintendents George W. Spates and Jacob B. Masters reported to the board on the damages to the canal by the recent military operations. Spates indicated that the United States Government "had sent a large force to repair the injuries on the Monocacy Division." The repairs would, in his opinion, be completed in about 8 days.[14]

After the failure of the Maryland invasion, the canal company, when it moved to discharge Walter, the lock keeper, for collaborating with the Confederates, received a petition from his neighbors. They asked that no disciplinary action be taken against him because of his efforts to save the Monocacy Aqueduct from destruction.[15]

---

[10] Trundel *et al*. to Board of Directors, Oct. 14, 1862, Ltrs. Recd., C & O Co.
[11] Bearss, "1862 Brings Hard Times," pp. 449-50.
[12] *Ibid*., p. 450.
[13] *Ibid*.
[14] Proceedings of the President and Board of Directors, L, 310-11.
[15] Petition to Board of Directors, Oct. 14, 1862, Ltrs. Recd., C & O Co. Walter had been employed on the canal as lock keeper for about 30 years.

On November 9, 1865, Otho W. Trundle requested permission from the board to build warehouses at Point of Rocks, Nolands Ferry, and the basin at the mouth of the Monocacy. Accordingly, the board agreed to allow Trundle to build the structures under the direction of the superintendent of the Monocacy Division. The terms of agreement specified that an annual rent of $36 per building was to be charged and that no intoxicating beverages could be sold on the premises.[16]

The board, on June 4, 1866, reported to the stockholders that

> In general, the masonry of the aqueducts, culverts and locks is both substantial and in good repair, the only exception requiring special remark being the aqueduct that spans the Conococheague River, which fine structure was wantonly and most seriously injured by rebel soldiers during the late rebellion.[17]

During the period 1868-69 the canal company spent $169,258.40 on ordinary repairs and $10,453.42 on extraordinary repairs. The board had found this expense necessary because of the damage inflicted on the waterway during the Civil War. Little had been done over the past decade "towards repairing and improving lock-houses, bridges, culverts, aqueducts, locks, lockgates and wastewears [sic] of the Company." Many of these structures "had become entirely unfit for use and were becoming worthless, rendering it absolutely essential . . . to have them repaired." The whole line, according to the directors, was "now in thorough, complete, and safe condition."[18]

The board, on July 1, 1869, ordered that "the Supt. of [the] Monocacy Division cause a railing to be erected on the towing path over Monocacy Aqueduct and to have the said towing path gravelled."[19]

On August 14, 1872, Chief Engineer William R. Hutton submitted to President Arthur P. Gorman a report on the condition of the C & O Canal along with recommendations for the repair of the canal structures. Concerning the aqueducts, Hutton observed that:

> All the aqueducts were built handsome and substantial structures, with as high finish and decoration as can be permitted in works of their class, but time and water have told heavily upon the older ones, and even the last built begin to show their effects. They are all sufficient to keep up navigation, but some of them will require extensive repairs before long.

Regarding Aqueducts Nos. 1 and 2, he noted that:

> No. 1, at Seneca, is in worse condition than was reported in June 1870. The masonry of the spandrils on the berme side is very loose and pushed out, and there are several cracks in the arches, the largest being as usual under the berme parapet. The same remarks apply to Monocacy Aqueduct, which is, however, built of a better material. In both the greatest displace-

[16] Proceedings of the President and Board of Directors, L. 458-59.
[17] *Thirty-Eighth Annual Report* (1866), C & O Co., p. 7.
[18] *Forty-First Annual Report* (1869), C & O., pp. 4-7.
[19] Proceedings of the President and Board of Directors, L, 166.

> ment of masonry is at the pilaster, where the spandril masonry is highest—both of them leak very much, and both will last some years without great repair. It would, perhaps, be some economy to allow them to remain until the danger of their condition becomes more imminent.[20]

Chief Engineer Thomas L. Patterson, on May 31, 1873, reported to the stockholders:

> Most of the aqueducts have been leaking more or less for years past; the consequence of which, owing to the freezing of water in the interior of the walls, has been a greater or less injury to their berm parapets and spandrils. This injury is so great, in the cases of the Seneca and Tonoloway Aqueducts, that it will be necessary to take down and rebuild a portion of the berm side of these structures.[21]

Available evidence does not indicate the effects of the floods of 1877, 1886, and 1889 on Aqueduct No. 2. The flood of 1889 forced the canal company to go into a receivership, with the Baltimore and Ohio Railroad emerging as the majority owner of the canal company bonds. Under the railroad's management, trustees were appointed and the canal entered its last period of operation. In 1924, after the railroad had captured almost all of its carrying trade, the Chesapeake and Ohio Canal ceased to operate. While documentary data in the C & O company records dealing with the maintenance and reconstruction problems during 19850-89 is sketchy, there is virtually *no* information dealing with these subjects for the years 1889-1924. However, secondary sources such as Sanderlin seem to indicate that the canal operated under the railroad much as it had in previous years.

In 1950 a field survey was made of the aqueducts, culverts, overpasses, and Paw Paw Tunnel on the canal by Engineer C. D. Geisler. He described the condition of the Monocacy Aqueduct as follows:

> *Monocacy Creek Aqueduct*.—This structure consists of six [seven] equal arch spans. The general condition of the arch barrel is good. Some of the joints in the arch barrel and in the faces of the piers need grouting. The face stones in the upstream spandrel and parapet should be taken down and relaid. The downstream face of the bridge is in a somewhat better condition, and a satisfactory repair of these stones could probably be made by cleaning and grouting the joints.[22]

---

[20] *Report of W. R. Hutton, Chief Engineer, As to Condition of Chesapeake and Ohio Canal, With Estimate of Cost of Extraordinary Repairs Required During the Current Year, August 14th, 1872* (Annapolis, 1872), pp. 15-16.
[21] *Forty-Fifth Annual Report* (1873), C & O., pp. 28-29.
[22] U. S. Congress, House, Committee on Public Lands, *Chesapeake and Ohio Canal Report*, 81st Cong., 2d sess., 1950, H. Doc. 687, p. 71. The excerpted portion of his report dealing with the condition of the aqueducts in general may be seen in Appendix D.

AFTERWORD:
The Stabilization of the Monocacy Aqueduct

From the Society for Industrial Archaeology Newsletter
Vol. 34, No. 4, Fall 2005
By Lawrence Biemiller

Dickerson, Md. — After 30 years in a steel girdle that held its deteriorating walls and arches together, the Chesapeake and Ohio Canal's landmark Monocacy Aqueduct has undergone a long anticipated stabilization. Thanks to a $6.4-million appropriation from Congress, its stonework was extensively repaired and reinforced, a new railing modeled on the original was installed, and the entire structure was sealed in a way that should prevent water and ice from working to pry it apart.

The aqueduct, 516 ft. from end to end, is the longest and best preserved on the canal, which runs 184 miles between Washington and Cumberland, MD. The aqueduct was constructed of white stone between 1829 and 1833 to a design by the canal's chief engineer, Benjamin Wright. Its seven shallow arches marked off by handsome pilasters immediately made it one of Maryland's most noted structures. Although the canal closed in 1924, a victim of repeated Potomac River floods and changing transportation needs, its towpath and most of its historic structures remain intact, and today the towpath is popular with bikers, hikers, runners, and nature lovers. It has been a National Historical Park since 1971.

But all of its aqueducts have suffered damage over the years. Denis J. McMullan, president of McMullan & Associates, served as engineer for both the Monocacy Aqueduct stabilization and for an earlier stabilization of the canal's Conococheague Aqueduct, which in 1920 lost its berm wall (the berm is the side of a canal opposite the towpath). McMullan says the canal's 11 stone aqueducts all face essentially the same two major problems.

The first is that while the canal was in use, the structures all leaked badly, as old photographs document. In warm weather, the leaks tunneled through the rubble that fills the interior space between the bottom of the canal prism and the upper surface of the stone arches. In cold weather, water that had leaked into the structures froze and expanded, loosening stones—particularly in the berm walls, which were about two ft. narrower than the towpath walls. Once the canal was drained for good, the leaking decreased, but the structures are still vulnerable to damage by whatever rainwater or snow melt gets inside.

The second problem is flooding, which brought not only water but also trees and other debris crashing down the streams that the aqueducts crossed. The canal's designers had put the towpath on the Potomac side of the waterway, which made sense for other reasons but means that the aqueducts' weaker sides are upstream, where they bear the brunt of the assaults from floods.

The two problems together, McMullan says, mean that the aqueducts are weakest just inside of their berm walls. Indeed, only three of the structures still have their berm walls and upstream spandrels completely intact—the Monocacy, Antietam, and Fifteen Mile Creek aqueducts. The Catoctin Aqueduct, all but one arch of which collapsed in 1973, had previously lost its berm wall and upstream spandrels as well as much of its rubble fill and upstream portions of its arches.

While the Monocacy Aqueduct has remained intact, a walk under the arch at either end reveals long cracks in the stonework beneath the berm wall. In places the upstream spandrels bulge so dramatically that they might have been drawn in by a cartoonist.

Hence the steel girdle, designed by Federal Highway Administration engineers, who also put hidden rods through arch stones to tie them together and partly filled the canal prism with dirt, to give the structure more weight and help it survive floods. The bracing not only surrounded and braced the aqueduct's exterior, but did the job that water in the prism once took care of, holding the berm and towpath walls apart.

Although some skeptics doubted that the bracing did much more than spoil the structure's beauty and make it miserable for bikers to cross, McMullan says the bracing was "a very good idea to hold it all together." Some other aqueducts on the canal sport similar bracing, although not as extensive as that fitted to the Monocacy. In any event, the Monocacy's unappealing steelwork encouraged members of the all-volunteer C&O Canal Association and the park's former superintendent, Douglas D. Faris, who died in 2004, to press for the stabilization project.

When McMullan and NPS officials began planning the stabilization, "we realized we needed something to hold the aqueduct together without its being visible," he says. Fortunately, the tie rods inserted in the arches in the 1970s were found to be in good condition and could remain. That was a start. New rods were inserted into the aqueduct's piers to hold them together, and their bases were grouted where the river had slightly undermined them.

The next step was dealing with the rubble fill. McMullan's plan, injecting grout into the voids, proved difficult and time-consuming. The project's contractor, Corman Construction, came up with an easier approach—removing most of the rubble and replacing it with a flowable, low-strength concrete mix.

But the stabilization's showpiece is a new, well-drained concrete slab poured in the canal prism. It adds weight to the structure and provides a tight seal to keep water out of the interior. It also gave McMullan a tough layer into which he could drill a new set of hidden tie rods that help brace the entire structure. The surface of the concrete is scored in a pattern resembling wood planks, which McMullan surmises may have formed the prism's original floor.

In addition to repairing and remortaring all of the structure's exterior stones, the stabilization brought a new railing to match the few sections of original iron railing that survive. But the new railing can be swiftly removed if flooding is predicted, instead of remaining in place to catch passing trees. "We want to keep this aqueduct another 150 years," McMullan says.

The aqueduct was formally rededicated May 21, 2005.

APPENDIXES

Appendix A: Estimates of Work Done on Aqueduct No. 2
Hovey and Legg, Contractors
A. P. Osborne, Contractor
Byrne and LeBaron, Contractors

Appendix B: Payments Made for the Construction of Aqueduct No. 2
Hovey and Legg, Contractors
A. P. Osborne, Contractor
Byrne and LeBaron, Contractors
Gideon Davis, Contractor for Railings For Aqueducts Nos. 1 and 2

Appendix C: T. H. S. Boyd's Description of the Temporary Railroad
From Sugarloaf Mountain to Aqueduct No. 2

Appendix D: Excerpt from "Report on Survey of Aqueduct and Miscellaneous Drainage
And Overpass Structures on the Chesapeake & Ohio Canal" By C. D. Geisler, 1950

Appendix A
Estimates of Work Done on Aqueduct No. 2

Hovey & Legg, Contractors

		Estimated Quantity	Contract Price	Estimate
1829				
April 9	2,480 Supl. ft.	cut stone	$0.40	$992.00
	650 Supl. ft.	cut stone partly delivered	.45	292.50
	1,500 Supl. ft.	quarried stone	.15	225.00
				$1,509.50
May 9	5,500 Supl. ft.	cut stone	.40	$2,200.00
	550 Supl. ft.	cut stone delivered	.50	275.00
	150 Supl. ft.	cut stone partly delivered	.45	67.50
	1,000 Supl. ft.	quarried stone	.15	150.00
	3,300 ft. - hewn timber delivered		.08	264.00
	2,800 ft. - hewn timber partly delivered		.07¾	217.00
				$3,173.50
June 5	7,612 Supl. ft.	cut stone	.50	$3,806.00
	1,675 Supl. ft.	cut stone delivered	.56	938.00
	1,470 Supl. ft.	stone quarried	.25	367.50
	3,300 Supl. ft. - hewn timber (linear measure) delivered		.08	264.00
	2,800 Supl. ft. - hewn timber (linear measure) partly delivered		.07¾	217.00
				$5,592.50
July 6	6,120 Supl. ft.	cut stone	.50	$3,060.00
	3,470 Supl. ft.	cut stone delivered	.58	2,012.60
	2,000 Supl. ft.	stone quarried	.25	500.00
	400 Supl. ft.	stone quarried and delivered	.33	132.00
	2,200 running ft. – hewn timber delivered		.10	220.00
	3,300 running ft. – hewn timber partly delivered		.09½	313.50
	On acct. of 2 coffer dams			200.00
	On acct. of foundation of 1 pier			200.00
				$6,638.10
Aug. 4	5,800 Supl. ft	cut stone	.50	2,900.00
	3,590 Supl. ft	cut stone delivered	.58	2,082.20
	1,600 Supl. ft.	stone quarried	.25	400.00
	350 Supl. ft.	stone quarried and delivered	.33	115.50
	2,200 running ft. - hewn timber delivered		.10	220.00
	3,300 running ft. - hewn timber partly delivered		.09½	313.50
	On acct. of 3 coffer dams			300.00
	185 perches of laid masonry		6.75	1,248.75
				$7,549.95

Aug.25	4,420 Supl. ft. cut stone	.50	$2,210.00
	4,520 Supl. ft. cut stone delivered	.58	2,621.60
	1,980 Supl. ft. stone quarried	.25	495.00
	550 Supl. ft. stone quarried and delivered	.33	181.50
	4,070 running ft. – hewn timber delivered	.10	407.00
	50 lbs. iron	.12	6.00
	215 perches of laid masonry	6.75	1,451.25
	On acct. of 3 coffer dams		300.00
			$7,672.35
Oct. 24	4,420 Supl. ft. cut stone	.50	2,210.00
	3,820 Supl. ft. cut stone delivered	.58	2,215.60
	1,908 Supl. ft. stone quarried	.25	495.00
	550 Supl. ft. stone quarried and delivered	.33	181.50
	4,070 running ft. – hewn timber delivered	.10	407.00
	50 lbs. iron	.12	6.00
	347 perches of laid masonry	6.75	2,342.25
	On acct. of 3 coffer dams		300.00
			$8,157.35
Nov.17	4,200 Supl. ft. cut stone	.50	2,100.00
	3,100 Supl. ft. cut stone delivered	.58	1,798.00
	1,400 Supl. ft. stone quarried	.25	350.00
	420 Supl. ft. stone quarried and delivered	.33	138.60
	4,070 running ft. – hewn timber	.10	407.00
	50 lbs. iron	.12	6.00
	600 perches of laid masonry	6.75	4,050.00
	On acct. of 4 coffer dams		370.00
			$9,219.60
Dec. 11	4,218 Supl. ft. cut stone	.50	2,109.00
	2,901 Supl. ft. cut stone delivered	.58	1,682.58
	621 Supl. ft. stone quarried	.25	155.25
	642 Supl. ft. stone quarried and delivered	.33	171.86
	4,610 running ft. – hewn timber	.10	461.00
	720 lbs. iron	.12	86.40
	642 perches of laid masonry	6.75	4,333.50
	On acct. of 4 coffer dams		370.00
			$9,369.59

A.P. Osborn, Contractor

1830				
Feb. 9	3,840 Supl. ft.	cut stone quarried	.50	$1,420.00
	95 Supl. ft.	cut stone delivered	.58	55.10
	1,650 Supl. ft.	stone quarried	.25	412.50
	270 cu. yds.	excavation for foundation for abutment	.18	48.60
				$1,936.20
1830				
Mar. 17	4,370 Supl. ft.	cut stone	.50	$2,185.00
	570 Supl. ft.	cut stone scabbled	.40	228.00
	600 Supl. ft.	cut stone quarried	.25	150.00
	2,200 Supl. ft.	cut stone delivered	.08	177.60
	900 cu. yds.	excavation for foundation of abutment	.18	162.00
				$2,902.60
May 4	4,146 Supl. ft.	stone quarried at Red Quarry	.31	1,288.36
	4,577 Supl. ft.	same stone cut	.27	1,235.79
	7,150 Supl. ft.	same stone delivered	.10	715.00
	200 Supl. ft.	stone quarried of White	.15	30.00
	150 Supl. ft.	same stone cut	.37	55.50
	576 Supl. ft.	same stone scabbled	.27	155.52
	600 Supl. ft.	same stone delivered	.16	105.60
	1,000 Supl. ft.	sheeting quarried	.25	250.00
	754 Supl. ft.	same stone cut	.75	565.50
	800 Supl. ft.	same stone delivered	.27½	220.00
	14 Ringstones finished		11.69	193.66
	650 Supl. ft.	rough sheeting quarried	.20	130.00
	543 Supl. ft.	same stone cut	.43	233.49
	500 Supl. ft.	same stone delivered	.28	140.00
	200 perches backing stone quarried		.50	100.00
	50 perches backing stone delivered		.50	25.00
	1,375 cu. yds.	Excavation for abutments	.18	247.50
	28 perches laid in abutments		1.50	142.50
	2,020 feet (running measure) of hewn timber		.10	202.00
				$6,005.42
June 7	1,450 Supl. ft.	ashlar quarried (white)	.15	217.50
	1,000 Supl. ft.	ashlar cut and delivered	.67	670.00
	1,500 Supl. ft.	sheeting quarried	.23	345.00
	1,070 Supl. ft.	sheeting cut and delivered	.87	930.90
	525 Supl. ft.	water table quarried	.08	42.00
	430 Supl. ft.	water table cut and delivered	.40	172.00
	980 Supl. ft.	beds quarried	.10	98.00
	950 Supl. ft.	beds cut and delivered	.60	570.00
	122 Supl. ft.	skewbacks quarried and cut	1.26	153.72

	40 Supl. ft.	skewbacks delivered	.40	9.60
	50 Supl. ft.	ringstones quarried	1.75	87.50
	33 Supl. ft.	ringstones cut and delivered	8.50	280.50
	2,020 running ft. – hewn timber		.10	202.00
	Preparing two foundations		400.00	800.00
	1,200 bushels	cement delivered	.25	300.00
	1,200 bushels	sand delivered	.06	72.00
	500 Supl. ft.	backing stone delivered	1.00	500.00
	495 perches	laying abutments	.80	396.00
	1,650 cu. yds.	common excavation	.18	297.00
	2,287 Supl. ft.	ashlar quarried (red)	.22	503.14
	3,550 Supl. ft.	ashlar cut (red)	.22	781.00
	6,688 Supl. ft.	ashlar delivered (red)	.08	535.04
	900 Supl. ft.	water table quarried, cut and delivered (red)	.35	315.00
				$8,277.90
July 6	2,300 Supl. ft.	ashlar quarried (white)	.15	345.00
	2,120 Supl. ft.	ashlar cut and delivered	.67	1,420.40
	1,500 Supl. ft.	sheeting quarried	.23	345.00
	1,120 Supl. ft.	sheeting cut and delivered	.87	1,026.60
	240 Supl. ft.	coping quarried	.11	26.40
	300 Supl. ft.	flagging quarried	.10	30.00
	770 Supl. ft.	water table quarried, cut and delivered	.48	369.60
	900 Supl. ft.	beds quarried, cut and delivered	.70	630.00
	122 Supl. ft.	skewbacks quarried and cut	1.26	153.72
	40 Supl. ft.	skewbacks delivered	.24	9.60
	58 Supl. ft.	ringstones quarried	1.75	101.50
	53 Supl. ft.	ringstones cut and delivered	8.50	450.50
	2,020 running ft. – hewn timber delivered		.10	202.00
	Preparing 4-¾ foundations		400.00	1,900.00
	1,717 bushels	cement delivered	.25	429.25
	2,500 bushels	sand delivered	.06	150.00
	850 Supl. ft.	backing stone delivered	1.00	850.00
	793 perches	laying abutments	.80	634.40
	222 perches	laying piers	1.30	288.60
	1,870 cu. yds.	common excavation	.18	336.60
	2,287 Supl. ft.	ashlar quarried (red)	.22	503.14
	3,550 Supl. ft.	ashlar quarried (red)	.22	781.00
	6,688 Supl. ft.	ashlar delivered	.08	535.04
	900 Supl. ft.	water table quarried, cut and delivered (red)	.35	315.00
				$11,833.35
Aug. 1	4,000 Supl. ft.	ashlar quarried (white)	.15	600.00
	3,300 Supl. ft.	ashlar cut and delivered	.67	2,211.00
	1,500 Supl. ft.	sheeting quarried	.23	345.00
	1,180 Supl. ft.	sheeting cut and delivered	.87	1,026.60

	350 Supl. ft.	coping quarried	.11	38.50
	300 Supl. ft.	flagging quarried	.10	30.00
	910 Supl. ft.	water table quarried, cut and delivered	.48	436.80
	900 Supl. ft.	beds quarried, cut and delivered	.70	630.00
	122 Supl. ft.	skewbacks quarried and cut	1.26	153.72
	40 Supl. ft.	skewbacks delivered	.24	9.60
	58 Supl. ft.	ringstones quarried	1.75	101.50
	53 Supl. ft.	ringstones cut and delivered	8.50	450.50
	2,890 running feet – hewn timber delivered		.10	289.00
	Preparing 5 foundations		400.00	2,000.00
	2,225 bushels	cement delivered	.25	556.25
	832 bushels	cement delivered (Shepherdstown)	.40	332.80
	3,100 bushels	sand delivered	.06	186.00
	1,000 Supl. ft.	backing stone delivered	1.00	1,000.00
	912 perches	laying abutments	.80	729.60
	253 perches	laying piers	1.30	328.90
	40 perches	laying arches, spandrels and parapets	1.85½	74.20
	1,870 cu. yds.	common excavation	.18	336.60
	2,287 Supl. ft.	ashlar quarried (red)	.22	503.14
	3,550 Supl. ft.	ashlar cut (red)	.22	781.00
	6,688 Supl. ft.	ashlar delivered (red)	.08	535.04
	900 Supl. ft.	water table quarried, cut and delivered (red)	.35	315.00
				$14,000.75
Aug.25	4,516 Supl. ft.	ashlar quarried (white)	.15	677.40
	3,766 Supl. ft.	ashlar cut	.48	1,807.68
	3,567 Supl. ft.	ashlar delivered	.19	677.73
	1,273 Supl. ft.	sheeting quarried	.23	292.79
	1,177 Supl. ft.	sheeting cut and delivered	.87	1,023.99
	150 Supl. ft.	coping quarried	.11	16.50
	300 Supl. ft.	flagging quarried	.10	30.00
	983 Supl. ft.	water table quarried	.08	78.64
	886 Supl. ft.	water table cut and delivered	.40	354.40
	1,105 Supl. ft.	beds quarried, cut and delivered	.70	773.50
	122 Supl. ft.	skewbacks quarried and cut	1.26	153.72
	40 Supl. ft.	skewbacks delivered	.24	9.60
	58 Supl. ft.	ringstones quarried	1.75	101.50
	52 Supl. ft.	ringstones cut and delivered	8.50	442.00
	2,890 running ft. – hewn timber delivered		.10	289.00
	Preparing 5 foundations		400.00	2,000.00
	2,248 bushels	cement delivered	.25	562.00
	714-½ bushels	cement delivered (Shepherdstown)	.40	285.80
	3,100 bushels	sand delivered	.06	186.00
	1,300 Supl. ft.	backing stone delivered	1.00	1,300.00
	80 Supl. ft.	backing stone quarried	.50	40.00
	1,126 perches	laying abutments	.80	900.00

272 perches	laying piers	1.30	353.60
40 perches	laying arches, spandrels and parapets	1.85½	74.20
1,870 cu. yds.	common excavation	.18	336.60
2,287 Supl. ft.	ashlar quarried (red)	.22	503.14
3,550 Supl. ft.	ashlar cut (red)	.22	781.00
6,688 Supl. ft.	ashlar delivered (red)	.08	535.04
900 Supl. ft.	water table quarried, cut and delivered	.35	315.00
			$14,901.63

Byrne & LeBaron, Contractors

Nov. 1	4,140 Supl. ft.	ashlar quarried (white)	.15	$621.00
	4,045 Supl. ft.	ashlar cut	.48	1,941.60
	1,911 Supl. ft.	ashlar delivered	.19	363.09
	76 Supl. ft.	sheeting quarried	.23	17.48
	411 Supl. ft.	coping quarried	.11	48.51
	500 Supl. ft.	flagging quarried	.10	50.00
	12 Supl. ft.	ringstones quarried	1.75	21.00
	1,776 running ft.	– hewn timber delivered	.10	177.60
				$3,365.28
Dec. 1	5,720 Supl. ft.	ashlar quarried (white)	.15	858.00
	5,625 Supl. ft.	ashlar cut	.48	2,700.00
	3,660 Supl. ft.	ashlar delivered	.19	695.40
	76 Supl. ft.	sheeting quarried	.23	17.48
	441 Supl. ft.	coping quarried	.15	48.51
	500 Supl. ft.	flagging quarried	.10	50.00
	12 Supl. ft.	ringstones quarried	1.75	21.00
	1,776 running ft.	– hewn timber delivered	.10	177.60
	800 bushels	cement delivered	.25	200.00
	682 bushels	sand delivered	.06	40.92
	100 perches	laying piers	1.30	130.00
				$4,938.91
1831				
Jan. 1	6,755 Supl. ft.	ashlar quarried (white)	.15	1,013.25
	6,660 Supl. ft.	ashlar cut	.48	3,196.80
	4,634 Supl. ft.	ashlar delivered	.19	880.46
	176 Supl. ft.	sheeting quarried	.23	40.48
	441 Supl. ft.	coping quarried	.11	48.51
	500 Supl. ft.	flagging quarried	.10	50.00
	22 Supl. ft.	ringstones quarried	1.75	38.50
	4 Supl. ft.	ringstones delivered	1.25	5.00
	1,776 running ft.	– hewn timber delivered	.10	177.60
	800 bushels	cement delivered	.25	200.00
	682 bushels	sand delivered	.06	40.92
	116 perches	laying abutments	.80	92.80

	136 perches	laying piers	1.30	176.80
				$5,961.12
Mar. 1	6,755 Supl. ft.	ashlar quarried (white)	.15	1,013.25
	7,129 Supl. ft.	ashlar cut	.48	3,421.92
	6,134 Supl. ft.	ashlar delivered	.19	1,165.46
	176 Supl. ft.	sheeting quarried	.23	40.48
	60 Supl. ft.	sheeting delivered	.24	14.40
	441 Supl. ft.	coping quarried	.11	48.51
	500 Supl. ft.	flagging quarried	.10	50.00
	22 Supl. ft.	ringstones quarried	1.75	38.50
	22 Supl. ft.	ringstones cut	7.25	159.50
	23 Supl. ft.	ringstones delivered	1.25	38.75
	1,776 running ft.	– hewn timber delivered	.10	177.60
	800 bushels	cement delivered	.25	200.00
	682 bushels	sand delivered	.06	40.92
	116 perches	laying abutments	.80	92.70
	136 perches	laying piers	1.30	176.80
				$6,668.89
Apr. 1	7,535 Supl. ft.	ashlar quarried (white)	.15	1,130.25
	7,776 Supl. ft.	ashlar cut	.48	3,732.48
	6,134 Supl. ft.	ashlar delivered	.19	1,165.46
	769 Supl. ft.	sheeting quarried	.23	176.87
	512 Supl. ft.	sheeting cut	.63	522.56
	60 Supl. ft.	sheeting delivered	.24	14.40
	441 Supl. ft.	coping quarried	.11	48.51
	500 Supl. ft.	flagging quarried	.10	50.00
	74 Supl. ft.	ringstones quarried	1.75	129.50
	62 Supl. ft.	ringstones cut	7.25	449.50
	23 Supl. ft.	ringstones delivered	1.25	28.75
	3,051 running ft.	– hewn timber	.10	305.10
	1,406 bushels	cement delivered	.25	351.50
	682 bushels	sand delivered	.06	40.92
	116 perches	laying abutments	.80	92.80
	136 perches	laying piers	1.30	176.80
				$8,215.40
May 1	10,520 Supl. ft.	ashlar quarried (white)	.15	1,578.00
	9,456 Supl. ft.	ashlar cut	.48	4,538.88
	7,174 Supl. ft.	ashlar delivered	.19	1,363.06
	1,338 Supl. ft.	sheeting quarried	.23	307.74
	1,081 Supl. ft.	sheeting cut	.63	681.03
	456 Supl. ft.	sheeting delivered	.24	109.44
	441 Supl. ft.	coping quarried	.11	48.51
	38 Supl. ft.	coping cut	.38	14.44

	500 Supl. ft.	flagging quarried	.10	50.00
	10 Supl. ft.	water table cut	.30	3.00
	55 Supl. ft.	skewbacks quarried	.50	27.50
	55 Supl. ft.	skewbacks cut	.76	41.80
	124 Supl. ft.	ringstones quarried	1.75	217.00
	112 Supl. ft.	ringstones cut	7.25	812.00
	62 Supl. ft.	ringstones delivered	1.25	77.50
	4,003 running ft. – hewn timber delivered		.10	400.30
	2,000 running ft. – hewn framing the same into centers		.08	160.00
	1,406 bushels	cement delivered	.25	351.50
	300 perches	pulling down piers	1.00	330.00
	1,608 bushels	sand delivered	.06	96.48
	376 Supl. ft.	backing stone delivered	1.00	376.00
	376 perches	laying abutments	.80	300.00
	336 perches	laying piers	1.30	436.80
				$12,321.78
June 1	11,700 Supl. ft.	ashlar quarried (white)	.15	1,755.00
	10,630 Supl. ft.	ashlar cut	.48	5,102.40
	8,855 Supl. ft.	ashlar delivered	.19	1,682.45
	1,533 Supl. ft.	sheeting quarried	.23	352.59
	1,276 Supl. ft.	sheeting cut	.63	803.88
	1,090 Supl. ft.	sheeting delivered	.24	261.60
	441 Supl. ft.	coping quarried	.11	48.51
	38 Supl. ft.	coping cut	.38	14.44
	500 Supl. ft.	flagging quarried	.10	50.00
	27 Supl. ft.	water table cut	.30	8.10
	320 Supl. ft.	skewbacks quarried	.50	160.00
	320 Supl. ft.	skewbacks cut	.76	243.20
	184 Supl. ft.	skewbacks delivered	.24	44.16
	174 Supl. ft.	ringstones quarried	1.75	304.50
	162 Supl. ft.	ringstones cut	7.25	1,174.50
	109 Supl. ft.	ringstones delivered	1.25	136.25
	4,004 running ft. – hewn timber delivered		.10	400.30
	3,900 running ft. – hewn framing the same into centers		.08	312.00
	4,000 running ft. – 3 inch plank for centers delivered		.04½	180.00
	Taking down and putting up centers		200.00	200.00
	2,238 bushels	cement delivered	.25	559.50
	397 perches	pulling down piers	1.00	397.00
	4,000 bushels	sand delivered	.06	240.00
	834 Supl. ft.	backing stone delivered	1.00	834.00
	420 perches	laying abutments	.80	336.00
	687 perches	laying piers	1.30	893.10
	130 perches	Laying arches, spandrels and parapets	1.85½	241.15
				$16,734.63

July 1	12,415 Supl. ft.	ashlar quarried (white)	.15	1,862.25
	11,345 Supl. ft.	ashlar cut	.48	5,445.60
	10,329 Supl. ft.	ashlar delivered	.19	1,943.51
	2,372 Supl. ft.	sheeting quarried	.23	545.56
	2,115 Supl. ft.	sheeting cut	.63	1,332.45
	1,993 Supl. ft.	sheeting delivered	.24	478.32
	441 Supl. ft.	coping quarried	.11	48.51
	38 Supl. ft.	coping cut	.38	14.44
	500 Supl. ft.	flagging quarried	.10	50.00
	715 Supl. ft.	additional price allowed for ashlar quarried	.15	107.25
	715 Supl. ft.	additional price allowed for ashlar cut	.05	35.75
	30 Supl. ft.	water table cut	.30	9.00
	839 Supl. ft.	add'l price allowed for sheeting quarried	.23	192.97
	839 Supl. ft.	additional price allowed for sheeting cut	.10	83.90
	502 Supl. ft.	skewbacks quarried	.50	251.00
	502 Supl. ft.	skewbacks cut	.76	381.52
	462 Supl. ft.	skewbacks delivered	.24	110.88
	217 Supl. ft.	ringstones quarried	1.75	379.75
	205 Supl. ft.	ringstones cut	7.25	1,486.25
	165 Supl. ft.	ringstones delivered	1.25	206.25
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	6,754 running ft.	– 3 inch plank delivered for centers	.04½	303.93
	Taking down and putting up centers		200.00	200.00
	3,097 bushels	cement delivered	.25	774.25
	397 perches	pulling down piers	1.00	397.00
	6,300 bushels	sand delivered	.06	378.00
	834 Supl. ft.	backing stone delivered	1.00	834.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	285 perches	laying arches, spandrels and parapets	1.85½	528.67½
				$20,947.87½
Aug. 1	12,911 Supl. ft.	ashlar quarried (white)	.15	1,936.35
	11,591 Supl. ft.	ashlar cut	.48	5,563.68
	10,964 Supl. ft.	ashlar delivered	.19	2,083.16
	3,239 Supl. ft.	sheeting quarried	.23	744.97
	2,966 Supl. ft.	sheeting cut	.63	1,868.58
	2,754 Supl. ft.	sheeting delivered	.24	660.96
	752 Supl. ft.	coping quarried	.11	82.72
	38 Supl. ft.	coping cut	.38	14.44
	500 Supl. ft.	flagging quarried	.10	50.00
	74 Supl. ft.	water table quarried	.08	5.92
	54 Supl. ft.	water table cut	.30	16.20
	653 Supl. ft.	skewbacks quarried	.50	326.50
	653 Supl. ft.	skewbacks cut	.76	496.28

	562 Supl. ft.	skewbacks delivered	.24	134.88
	269 Supl. ft.	ringstones quarried	1.75	470.75
	257 Supl. ft.	ringstones cut	7.25	1,863.25
	217 Supl. ft.	ringstones delivered	1.25	271.25
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	6,754 running ft.	– 2 inch plank for centers delivered	.04½	303.93
	Taking down and putting up centers		200.00	200.00
	3,097 bushels	Tuscarora cement delivered	.25	774.25
	6,300 bushels	sand delivered	.06	378.00
	397 perches	pulling down piers	1.00	397.00
	834 Supl. ft.	backing stone delivered	1.00	834.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	504 perches	laying arches, spandrels and parapets	1.85½	934.92
	1,211 Supl. ft.	additional allowance on ashlar quarried	.15	181.65
	961 Supl. ft.	additional allowance on ashlar cut	.05	48.05
	1,706 Supl. ft.	additional allowance on sheeting quarried	.23	392.38
	1,690 Supl. ft.	Additional allowance on sheeting cut	.10	169.00
	311 Supl. ft.	additional allowance on coping quarried	.11	34.21
				$23,804.44
Oct. 1	13,490 Supl. ft.	ashlar quarried (white)	.15	2,023.44
	12,088 Supl. ft.	ashlar cut	.48	5,802.24
	11,418 Supl. ft.	ashlar delivered	.19	2,169.42
	4,200 Supl. ft.	sheeting quarried	.23	966.00
	4,000 Supl. ft.	sheeting cut	.63	2,520.00
	3,600 Supl. ft.	sheeting delivered	.24	864.00
	977 Supl. ft.	coping quarried	.11	107.47
	236 Supl. ft.	coping cut	.38	89.68
	286 Supl. ft.	coping delivered	.11	31.46
	500 Supl. ft.	flagging quarried	.10	50.00
	131 Supl. ft.	water table quarried	.08	10.48
	77 Supl. ft.	water table cut	.30	23.10
	55 Supl. ft.	water table delivered	.10	5.50
	822 Supl. ft.	skewbacks quarried	.50	411.00
	822 Supl. ft.	skewbacks cut	.76	624.72
	741 Supl. ft.	skewbacks delivered	.24	177.84
	342 Supl. ft.	ringstones quarried	1.75	598.50
	350 Supl. ft.	ringstones cut	7.25	2,537.50
	334 Supl. ft.	ringstones delivered	1.25	417.50
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	6,754 running ft.	– 2 inch plank for centers delivered	.04½	303.93
	Taking down and putting up centers		200.00	200.00
	3,097 bushels	Tuscarora cement delivered	.25	774.25

	6,300 bushels	sand delivered	.06	378.00
	397 perches	pulling down piers	1.00	397.00
	834 Supl. ft.	backing stone delivered	1.00	834.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	504 perches	laying arches, spandrels and parapets	1.85½	934.92
	1,790 Supl. ft.	additional allowance for ashlar quarried	.15	268.50
	1,458 Supl. ft.	additional allowance for ashlar cut	.05	72.90
	2,666 Supl. ft.	additional allowance for sheeting quarried	.23	613.18
	2,690 Supl. ft.	additional allowance for sheeting cut	.10	269.00
	540 Supl. ft.	additional allowance for coping quarried	.11	59.40
				$27,101.85
Nov. 1	14,246 Supl. ft.	ashlar quarried (white)	.15	2,136.90
	12,844 Supl. ft.	ashlar cut	.48	6,165.12
	11,924 Supl. ft.	ashlar delivered	.19	2,265.56
	4,825 Supl. ft.	sheeting quarried	.23	1,109.75
	4,625 Supl. ft.	sheeting cut	.63	2,913.75
	4,215 Supl. ft.	sheeting delivered	.24	1,011.60
	977 Supl. ft.	coping quarried	.11	107.47
	236 Supl. ft.	coping cut	.38	89.68
	286 Supl. ft.	coping delivered	.11	31.46
	500 Supl. ft.	flagging quarried	.10	50.00
	131 Supl. ft.	water table quarried	.08	10.48
	77 Supl. ft.	water table cut	.30	23.10
	55 Supl. ft.	water table delivered	.10	5.50
	901 Supl. ft.	skewbacks quarried	.50	450.50
	901 Supl. ft.	skewbacks cut	.76	684.76
	842 Supl. ft.	skewbacks delivered	.24	202.08
	402 Supl. ft.	ringstones quarried	1.75	703.50
	410 Supl. ft.	ringstones cut	7.25	2,972.50
	392 Supl. ft.	ringstones delivered	1.25	490.00
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	9,700 running ft.	– 2 inch plank for centers delivered	.04½	436.50
	Taking down and putting up centers		200.00	300.00
	3,527 bushels	Tuscarora cement delivered	.25	881.75
	6,962 bushels	sand delivered	.06	417.72
	397 perches	pulling down piers	1.00	397.00
	984 Supl. ft.	backing stone delivered	1.00	984.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	842 perches	laying arches, spandrels and parapets	1.85½	1,561.91
	2,546 Supl. ft.	additional allowance for ashlar quarried	.15	381.90
	2,214 Supl. ft.	additional allowance for ashlar cut	.05	110.70
	3,292 Supl. ft.	additional allowance for sheeting quarried	.23	757.16

	3,349 Supl. ft.	additional allowance for sheeting cut	.10	334.90
	536 Supl. ft.	additional allowance for coping quarried	.11	58.96
				$30,613.07
Dec. 1	14,834 Supl. ft.	ashlar quarried (white)	.48	2,225.10
	13,432 Supl. ft.	ashlar cut	.48	6,447.36
	12,386 Supl. ft.	ashlar delivered	.19	2,353.34
	5,800 Supl. ft.	sheeting quarried	.23	1,334.00
	5,600 Supl. ft.	sheeting cut	.63	3,528.00
	5,122 Supl. ft.	sheeting delivered	.24	1,229.28
	977 Supl. ft.	coping quarried	.11	107.47
	236 Supl. ft.	coping cut	.38	89.68
	286 Supl. ft.	coping delivered	.11	31.46
	500 Supl. ft.	flagging quarried	.10	50.00
	326 Supl. ft.	water table quarried	.08	26.08
	272 Supl. ft.	water table cut	.30	81.60
	84 Supl. ft.	water table delivered	.10	8.40
	1,113 Supl. ft.	skewbacks quarried	.50	556.50
	1,113 Supl. ft.	skewbacks cut	.76	845.88
	960 Supl. ft.	skewbacks delivered	.24	230.40
	441 Supl. ft.	ringstones quarried	1.75	771.75
	449 Supl. ft.	ringstones cut	7.25	3,255.25
	435 Supl. ft.	ringstones delivered	1.25	543.75
	6,510 running ft. – hewn timber delivered		.10	651.00
	6,407 running ft. – hewn framing for the same into centers		.08	512.56
	9,700 running ft. – 2 inch plank for centers delivered		.04½	436.50
	4,576 bushels	Tuscarora cement delivered	.25	1,144.00
	8,425 bushels	sand delivered	.06	505.00
	397 perches	pulling down piers	1.00	397.00
	1,200 Supl. ft.	backing stone delivered	1.00	1,200.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	1,300 perches	laying arches, spandrels and parapets	1.85½	2,411.50
	3,134 Supl. ft.	additional allowance for ashlar quarried	.15	470.10
	2,802 Supl. ft.	additional allowance for ashlar cut	.05	140.10
	4,267 Supl. ft.	additional allowance for sheeting quarried	.23	981.41
	4,324 Supl. ft.	additional allowance for sheeting cut	.10	432.40
	536 Supl. ft.	additional allowance for coping quarried	.11	58.96
				$34,579.63
1832				
Jan. 2	14,957 Supl. ft.	ashlar quarried (white)	.15	2,243.55
	13,555 Supl. ft.	ashlar cut	.48	6,506.40
	12,554 Supl. ft.	ashlar delivered	.19	2,385.26
	6,645 Supl. ft.	sheeting quarried	.23	1,528.35
	6,645 Supl. ft.	sheeting cut	.63	4,060.35
	5,864 Supl. ft.	sheeting delivered	.24	1,407.36

	977 Supl. ft.	coping quarried	.11	107.47
	236 Supl. ft.	coping cut	.38	89.68
	286 Supl. ft.	coping delivered	.11	31.46
	500 Supl. ft.	flagging quarried	.10	50.00
	374 Supl. ft.	water table quarried	.08	29.92
	320 Supl. ft.	water table cut	.30	96.00
	132 Supl. ft.	water table delivered	.10	13.20
	1,113 Supl. ft.	skewbacks quarried	.50	556.50
	1,113 Supl. ft.	skewbacks cut	.76	845.88
	1,020 Supl. ft.	skewbacks delivered	.24	244.80
	450 Supl. ft.	ringstones quarried	1.75	787.50
	458 Supl. ft.	ringstones cut	7.25	3,320.50
	447 Supl. ft.	ringstones delivered	1.25	558.75
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	9,700 running ft.	– 2 inch plank for centers delivered	.04½	436.50
	Taking down and putting up centers		200.00	300.00
	4,739 bushels	Tuscarora cement delivered	.25	1,184.75
	8,625 bushels	sand delivered	.06	517.50
	397 perches	pulling down piers	1.00	397.00
	1,200 Supl. ft.	backing stone delivered	1.00	1,200.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	1,420 perches	laying arches, spandrels and parapets	1.85½	2,634.10
	3,257 Supl. ft.	additional allowance for ashlar quarried	.15	488.55
	2,925 Supl. ft.	additional allowance for ashlar cut	.05	146.25
	5,112 Supl. ft.	additional allowance for sheeting quarried	.23	1,175.76
	5,169 Supl. ft.	additional allowance for sheeting cut	.10	516.90
	536 Supl. ft.	additional allowance for coping quarried	.11	58.96
				$36,486.06
Feb. 1	15,361 Supl. ft.	ashlar quarried (white)	.15	2,304.15
	13,959 Supl. ft.	ashlar cut	.48	6,700.32
	12,612 Supl. ft.	ashlar delivered	.19	2,396.28
	7,356 Supl. ft.	sheeting quarried	.23	1,691.88
	7,156 Supl. ft.	sheeting cut	.63	4,508.28
	6,281 Supl. ft.	sheeting delivered	.24	1,507.44
	977 Supl. ft.	coping quarried	.11	107.47
	236 Supl. ft.	coping cut	.38	89.68
	300 Supl. ft.	coping delivered	.11	33.00
	500 Supl. ft.	flagging quarried	.10	50.00
	478 Supl. ft.	water table quarried	.08	38.24
	424 Supl. ft.	water table cut	.30	127.20
	144 Supl. ft.	water table delivered	.10	14.40
	1,147 Supl. ft.	skewbacks quarried	.50	573.50
	1,147 Supl. ft.	skewbacks cut	.76	871.72

	1,054 Supl. ft.	skewbacks delivered	.24	252.96
	461 Supl. ft.	ringstones quarried	1.75	806.75
	469 Supl. ft.	ringstones cut	7.25	3,400.25
	454 Supl. ft.	ringstones delivered	1.25	567.50
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	9,700 running ft.	– 2 inch plank for centers delivered	.04½	436.50
	Taking down and putting up centers		200.00	300.00
	4,739 bushels	Tuscarora cement delivered	.25	1,184.75
	8,625 bushels	sand delivered	.06	517.50
	397 perches	pulling down piers	1.00	397.00
	1,200 Supl. ft.	backing stone delivered	1.00	1,200.00
	420 perches	Laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	1,420 perches	laying arches, spandrels and parapets	1.85½	2,634.10
	3,661 Supl. ft.	additional allowance for ashlar quarried	.15	549.15
	3,329 Supl. ft.	additional allowance for ashlar cut	.05	166.45
	5,823 Supl. ft.	additional allowance for sheeting quarried	.23	1,339.29
	5,880 Supl. ft.	additional allowance for sheeting cut	.10	588.00
	536 Supl. ft.	additional allowance for coping quarried	.11	58.96
				$37,979.58
Mar. 1	15,779 Supl. ft.	ashlar quarried (white)	.15	2,366.85
	14,377 Supl. ft.	ashlar cut	.48	6,900.96
	12,827 Supl. ft.	ashlar delivered	.19	2,437.13
	8,575 Supl. ft.	sheeting quarried	.23	1,972.25
	8,375 Supl. ft.	sheeting cut	.63	5,276.25
	6,456 Supl. ft.	sheeting delivered	.24	1,549.44
	977 Supl. ft.	coping quarried	.11	107.47
	236 Supl. ft.	coping cut	.38	89.68
	300 Supl. ft.	coping delivered	.11	33.00
	500 Supl. ft.	flagging quarried	.10	50.00
	518 Supl. ft.	water table quarried	.36	41.44
	464 Supl. ft.	water table cut	.11	139.20
	144 Supl. ft.	water table delivered	.08	14.40
	1,267 Supl. ft.	skewbacks quarried	.50	633.50
	1,267 Supl. ft.	skewbacks cut	.76	962.92
	1,218 Supl. ft.	skewbacks delivered	.24	292.32
	471 Supl. ft.	ringstones quarried	1.75	824.25
	479 Supl. ft.	ringstones cut	7.25	3,472.75
	454 Supl. ft.	ringstones delivered	1.25	567.50
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	9,700 running ft.	– 2 inch plank for centers delivered	.04½	436.50
	5,040 bushels	Tuscarora cement delivered	.25	1,260.00
	8,625 bushels	sand delivered	.06	517.50

	397 perches	pulling down piers	1.00	397.00
	1,200 Supl. ft.	backing stone delivered	1.00	1,200.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	1,420 perches	laying arches, spandrels and parapets	1.85½	2,634.10
	4,079 Supl. ft.	additional allowance for ashlar quarried	.15	611.25
	3,747 Supl. ft.	additional allowance for ashlar cut	.05	187.35
	7,042 Supl. ft.	additional allowance for sheeting quarried	.23	1,619.66
	7,099 Supl. ft.	additional allowance for sheeting cut	.10	709.90
	536 Supl. ft.	additional allowance for coping quarried	.11	58.96
				$40,230.99
Apr. 2	16,352 Supl. ft.	ashlar quarried (white)	.15	2,452.80
	14,950 Supl. ft.	ashlar cut	.48	7,176.00
	13,314 Supl. ft.	ashlar delivered	.19	2,529.66
	9,227 Supl. ft.	sheeting quarried	.23	2,122.21
	9,089 Supl. ft.	sheeting cut	.63	5,726.07
	7,430 Supl. ft.	sheeting delivered	.24	1,783.20
	2,777 Supl. ft.	coping quarried	.11	305.47
	2,036 Supl. ft.	coping cut	.38	773.68
	503 Supl. ft.	coping delivered	.11	55.33
	500 Supl. ft.	flagging quarried	.10	50.00
	574 Supl. ft.	water table quarried	.08	45.92
	520 Supl. ft.	water table cut	.30	156.00
	187 Supl. ft.	water table delivered	.10	18.70
	1,278 Supl. ft.	skewbacks quarried	.50	639.00
	1,278 Supl. ft.	skewbacks cut	.76	971.28
	1,360 Supl. ft.	skewbacks delivered	.24	326.40
	493 Supl. ft.	ringstones quarried	1.75	862.75
	501 Supl. ft.	ringstones cut	7.25	3,632.25
	485 Supl. ft.	ringstones delivered	1.25	606.25
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	9,700 running ft.	– 2 inch plank for centers delivered	.04½	436.50
	Taking down and putting up centers		200.00	360.00
	5,292 bushels	Tuscarora cement delivered	.25	1,323.00
	9,425 bushels	sand delivered	.06	565.50
	397 perches	pulling down piers	1.00	397.00
	1,350 Supl. ft.	backing stone delivered	1.00	1,350.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	1,700 perches	laying arches, spandrels and parapets	1.85½	3,153.50
	4,652 Supl. ft.	additional allowance for ashlar quarried	.15	697.80
	4,320 Supl. ft.	additional allowance for ashlar cut	.05	216.00
	7,756 Supl. ft.	additional allowance for sheeting quarried	.23	1,783.88
	7,813 Supl. ft.	additional allowance for sheeting cut	.10	781.30

	2,336 Supl. ft.	additional allowance for coping quarried	.11	256.96
				$44,121.27
May 8	17,252 Supl. ft.	ashlar quarried (white)	.15	2,587.80
	15,884 Supl. ft.	ashlar cut	.48	7,624.32
	13,854 Supl. ft.	ashlar delivered	.19	2,632.26
	9,227 Supl. ft.	sheeting quarried	.23	2,122.21
	9,323 Supl. ft.	sheeting cut	.63	5,873.49
	8,330 Supl. ft.	sheeting delivered	.24	1,999.20
	4,742 Supl. ft.	coping quarried	.11	521.62
	4,001 Supl. ft.	coping cut	.38	1,520.38
	1,365 Supl. ft.	coping delivered	.11	150.15
	500 Supl. ft.	flagging quarried	.10	50.00
	746 Supl. ft.	water table quarried	.08	59.68
	692 Supl. ft.	water table cut	.30	207.60
	349 Supl. ft.	water table delivered	.10	34.90
	1,278 Supl. ft.	skewbacks quarried	.50	639.00
	1,278 Supl. ft.	skewbacks cut	.76	971.28
	1,360 Supl. ft.	skewbacks delivered	.24	326.40
	566 Supl. ft.	ringstones quarried	1.75	990.50
	574 Supl. ft.	ringstones cut	7.25	4,161.50
	543 Supl. ft.	ringstones delivered	1.25	678.75
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	9,700 running ft.	– 2 inch plank for centers delivered	.04½	436.50
	Taking down and putting up centers		200.00	600.00
	8,688 Supl. ft.	2-inch plank for bottom of trunk	.03	260.64
	7,063 bushels	Shepherdstown cement delivered	.25	1,765.75
	11,025 bushels	sand delivered	.06	661.50
	397 perches	taking down piers	1.00	397.00
	2,050 Supl. ft.	backing stone delivered	1.00	2,050.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	2,900 perches	laying arches, spandrels and parapets	1.85½	5,379.50
	5,531 Supl. ft.	additional allowance for ashlar quarried	.15	829.65
	5,199 Supl. ft.	additional allowance for ashlar cut	.05	259.95
	7,694 Supl. ft.	additional allowance for sheeting quarried	.23	1,769.62
	8,047 Supl. ft.	additional allowance for sheeting cut	.10	804.70
	4,301 Supl. ft.	additional allowance for coping quarried	.11	473.11
				$51,405.82
June 1	17,252 Supl. ft.	ashlar quarried (white)	.15	2,587.80
	16,134 Supl. ft.	ashlar cut	.48	7,744.32
	14,530 Supl. ft.	ashlar delivered	.19	2,760.70
	9,227 Supl. ft.	sheeting quarried	.23	2,122.21
	9,323 Supl. ft.	sheeting cut	.63	5,873.49

	9,323 Supl. ft.	sheeting delivered	.24	2,237.52
	6,742 Supl. ft.	coping quarried	.11	741.62
	5,500 Supl. ft.	coping cut	.38	2,090.00
	1,365 Supl. ft.	coping delivered	.11	150.15
	800 Supl. ft.	water table quarried	.08	64.00
	800 Supl. ft.	water table cut	.30	240.00
	800 Supl. ft.	water table delivered	.10	80.00
	1,278 Supl. ft.	skewbacks quarried	.50	639.00
	1,278 Supl. ft.	skewbacks cut	.76	971.28
	1,360 Supl. ft.	skewbacks delivered	.24	326.40
	572 Supl. ft.	ringstones quarried	1.75	1,001.00
	578 Supl. ft.	ringstones cut	7.25	4,190.50
	578 Supl. ft.	ringstones delivered	1.25	722.50
	6,510 running ft.	– Hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	9,700 running ft.	– 2 inch plank for centers delivered	.04½	436.50
	Taking down and putting up centers		200.00	200.00
	4,988 Supl. ft.	2-inch plank for bottom of trunk	.04½	224.46
	9,976 bushels	Shepherdstown cement delivered	.25	2,494.00
	11,350 bushels	sand delivered	.06	681.00
	397 perches	taking down piers	1.00	397.00
	2,280 Supl. ft.	backing stone delivered	1.00	2,280.00
	420 perches	laying abutments	.80	336.00
	821 perches	laying piers	1.30	1,067.30
	3,300 perches	laying arches, spandrels and parapets	1.85½	6,121.50
	5,531 Supl. ft.	additional allowance for ashlar quarried	.15	829.65
	5,449 Supl. ft.	additional allowance for ashlar cut	.05	272.45
	7,694 Supl. ft.	additional allowance for sheeting quarried	.23	1,769.62
	8,047 Supl. ft.	additional allowance for sheeting cut	.10	804.70
	5,801 Supl. ft.	additional allowance for coping quarried	.11	638.11
				$54,658.34
July 1	18,209 Supl. ft.	ashlar quarried (white)	.15	2,731.35
	17,091 Supl. ft.	ashlar cut	.48	8,203.68
	15,965 Supl. ft.	ashlar delivered	.19	3,033.35
	9,227 Supl. ft.	sheeting quarried	.23	2,122.21
	9,323 Supl. ft.	sheeting cut	.63	5,873.49
	9,323 Supl. ft.	sheeting deteriorated	.24	2,237.52
	8,519 Supl. ft.	coping quarried	.11	937.09
	7,277 Supl. ft.	coping cut	.38	2,765.26
	2,510 Supl. ft.	coping delivered	.11	276.10
	957 Supl. ft.	water table quarried	.08	76.56
	1,054 Supl. ft.	water table cut	.30	316.20
	1,054 Supl. ft.	water table delivered	.10	105.40
	1,278 Supl. ft.	skewbacks quarried	.50	639.00
	1,278 Supl. ft.	skewbacks cut	.76	971.28

	1,360 Supl. ft.	skewbacks delivered	.24	326.40
	572 Supl. ft.	ringstones quarried	1.75	1,001.00
	578 Supl. ft.	ringstones cut	7.25	4,190.50
	578 Supl. ft.	ringstones delivered	1.25	722.50
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	9,700 running ft.	– 2 inch plank for centers delivered	.04½	436.50
	Taking down and putting up centers		200.00	600.00
	4,988 running ft.	2-inch plank for bottom of trunk	.04½	224.46
	13,257 bushels	Shepherdstown cement delivered	.25	3,314.25
	12,109 bushels	sand delivered	.06	397.00
	397 perches	taking down piers	1.00	397.00
	3,080 Supl. ft.	backing stone delivered	1.00	3,080.00
	800 perches	laying abutments	.80	640.00
	821 perches	laying piers	1.30	1,067.30
	4,000 perches	laying arches, spandrels and parapets	1.85½	7,420.00
	6,488 Supl. ft.	additional allowance for ashlar quarried	.15	973.20
	6,406 Supl. ft.	additional allowance for ashlar cut	.05	320.30
	7,694 Supl. ft.	additional allowance for sheeting quarried	.23	1,769.62
	8,047 Supl. ft.	additional allowance for sheeting cut	.10	804.70
	7,578 Supl. ft.	additional allowance for coping quarried	.11	833.58
				$60,299.90
Aug. 1	20,162 Supl. ft.	ashlar quarried (white)	.15	3,024.30
	20,601 Supl. ft.	ashlar cut	.48	9,888.48
	20,700 Supl. ft.	ashlar delivered	.19	3,933.00
	9,227 Supl. ft.	sheeting quarried	.23	2,122.21
	9,323 Supl. ft.	sheeting cut	.63	5,873.49
	9,323 Supl. ft.	sheeting delivered	.24	2,237.52
	9,225 Supl. ft.	coping quarried	.11	1,014.75
	7,983 Supl. ft.	coping cut	.38	3,033.54
	7,076 Supl. ft.	coping delivered	.11	778.36
	957 Supl. ft.	water table quarried	.08	76.56
	1,054 Supl. ft.	water table cut	.30	316.20
	1,054 Supl. ft.	water table delivered	.10	105.40
	1,278 Supl. ft.	skewbacks quarried	.50	639.00
	1,278 Supl. ft.	skewbacks cut	.76	971.28
	1,360 Supl. ft.	skewbacks delivered	.24	326.40
	572 Supl. ft.	ringstones quarried	1.75	1,001.00
	578 Supl. ft.	ringstones cut	7.25	4,190.50
	578 Supl. ft.	ringstones delivered	1.25	722.50
	6,510 running ft.	– hewn timber delivered	.10	651.00
	6,407 running ft.	– hewn framing the same into centers	.08	512.56
	9,700 running ft.	– 2 inch plank for centers delivered	.04½	436.50
	Taking down and putting up centers		200.00	600.00
	4,988 running ft.	– 2 inch plank for bottom of trunk	.04½	224.46

	2,100 running ft. – timber for bottom, etc.		.12	252.00
	14,131 bushels	Shepherdstown cement delivered	.25	3,532.75
	12,109 bushels	sand delivered	.06	726.54
	397 perches	taking down piers	1.00	397.00
	3,580 Supl. ft.	backing stone delivered	1.00	3,580.00
	1,077 perches	laying abutments	.80	861.60
	821 perches	laying piers	1.30	1,067.30
	4,410 perches	laying arches, spandrels and parapets	1.85½	8,180.55
	9,998 Supl. ft.	additional allowance for ashlar quarried	.15	1,499.70
	9,916 Supl. ft.	additional allowance for ashlar cut	.05	435.80
	7,694 Supl. ft.	additional allowance for sheeting quarried	.23	1,769.62
	8,047 Supl. ft.	additional allowance for sheeting cut	.10	804.70
	8,284 Supl. ft.	additional allowance for coping quarried	.11	911.24
				$66,757.81
Oct. 1	20,887 Supl. ft.	ashlar quarried (white)	.15	3,133.05
	21,326 Supl. ft.	ashlar cut	.48	10,236.48
	21,348 Supl. ft.	ashlar delivered	.19	4,056.12
	Sheeting quarried, cut & delivered (see Aug. 1 estimate)			10,233.22
	12,300 Supl. ft.	coping quarried	.11	1,353.00
	11,058 Supl. ft.	coping cut	.38	4,202.04
	9,046 Supl. ft.	coping delivered	.11	995.06
	957 Supl. ft.	water table quarried	.08	76.56
	1,054 Supl. ft.	water table cut	.30	316.20
	1,054 Supl. ft.	water table delivered	.10	105.40
	Skewbacks quarried, cut & delivered (see Aug. 1 estimate)			1,936.68
	Ringstones quarried, cut & delivered (see Aug. 1 estimate)			5,914.00
	Hewn timber delivered & framed into centers (see Aug. 1 est.)			1,600.06
	Taking down and putting up centers		200.00	600.00
	4,988 Supl. ft.	2-inch plank for bottom of trunk	.04½	224.46
	2,100 Supl. ft.	Timber for bottom, etc.	.12	252.00
	14,131 bushels	Shepherdstown cement delivered	.25	3,532.75
	13,146 bushels	sand delivered	.06	788.76
	397 perches	taking down piers	1.00	397.00
	3,580 Supl. ft.	backing stone delivered	1.00	3,580.00
	1,077 perches	laying abutments	.80	861.60
	821 perches	laying piers	1.30	1,067.30
	4,690 perches	laying arches, spandrels and parapets	1.85½	8,699.95
	10,923 Supl. ft.	additional allowance for ashlar quarried	.15	1,608.45
	10,641 Supl. ft.	additional allowance for ashlar cut	.05	532.05
	Additional allowance for sheeting quarried and cut (see August 1 estimate)			2,574.32
	11,359 Supl. ft.	additional allowance for coping quarried	.11	1,249.49
				$70,126.00

Nov. 1	20,887 Supl. ft. ashlar quarried (white)	.15	3,133.05
	21,326 Supl. ft. ashlar cut	.48	10,236.48
	21,348 Supl. ft. ashlar delivered	.19	4,056.12
	Sheeting quarried, cut & delivered (see Aug. 1 estimate)		10,233.22
	12,300 Supl. ft. coping quarried	.11	1,353.00
	11,058 Supl. ft. coping cut	.38	4,202.04
	9,046 Supl. ft. coping delivered	.11	995.06
	957 Supl. ft. water table quarried	.08	76.56
	1,054 Supl. ft. water table cut	.30	316.20
	1,054 Supl. ft. water table delivered	.10	105.40
	Skewbacks quarried, cut & delivered (see Aug. 1 estimate)		1,936.68
	Ringstones quarried, cut & delivered (see Aug. 1 estimate)		5,914.00
	Hewn timber delivered & framed into centers (see Aug. 1 est.)		1,600.06
	Taking down and putting up centers	200.00	600.00
	4,988 running ft. – 2 inch plank for bottom of trunk	.04½	224.46
	2,100 running ft. – timber for bottom, etc.	.12	252.00
	14,131 bushels Shepherdstown cement delivered	.25	3,532.75
	13,146 bushels sand delivered	.06	788.76
	397 perches taking down piers	1.00	397.00
	4,180 Supl. ft. backing stone delivered	1.00	4,180.00
	1,077 perches laying abutments	.80	861.60
	821 perches laying piers	1.30	1,067.30
	5,790 perches laying arches, spandrels and parapets	1.85½	10,740.45
	10,723 Supl. ft. additional allowance for ashlar quarried	.15	1,608.45
	10,641 Supl. ft. additional allowance for ashlar cut	.05	532.05
	Additional allowance for sheeting quarried and cut (see August 1 estimate)		2,574.32
	11,359 Supl. ft. coping quarried	.11	1,249.49
			$72,766.50

Adjustment of Final Estimate

Dec. 1	Sheeting quarried, cut & delivered (see Aug. 1 estimate)		10,233.22
	10,010 Supl. ft. coping quarried	.11	1,101.10
	9,720 Supl. ft. coping cut	.38	3,693.60
	9,720 Supl. ft. coping delivered	.11	1,069.20
	1,082 Supl. ft. water table quarried	.08	86.56
	1,179 Supl. ft. water table cut	.30	353.70
	1,179 Supl. ft. water table delivered	.10	117.90
	Skewbacks quarried, cut & delivered (see Aug. 1 estimate)		1,936.68
	Ringstones quarried, cut & delivered (see Aug. 1 estimate)		5,914.00
	Hewn timber delivered & framed into centers (see Aug. 1 est.)		1,600.06
	Taking down and putting up centers	200.00	600.00
	9,569 Supl. ft. coping quarried	.11	1,052.59
			$71,943.40

In addition to this total, Byrne and LeBaron were allowed $3,000 for 2-½ miles of railroad built to haul stone from Sugarloaf Mountain. They were also given an additional $38 for moving stones from the ground to be occupied by the embankment of Section No. 73.

Estimates from Assessment Book of the 5th Residency of the 1st Division, 1829-33, RG 79, National Archives.

Appendix B
Payments Made for the Construction of Aqueduct No. 2

Hovey & Legg, Contractors

Debit			Credit		
1829			1829		
April 22	to Clemt. Smith, Treas.	$1,434.03	April	for Construction	$1,509.50
May 13	to Clemt. Smith, Treas.	1,497.60	May	for Construction	1,664.00
June 10	to Clemt. Smith, Treas.	2,177.10	June	for Construction	2,419.00
July 8	to Clemt. Smith, Treas.	941.04	July 1	for Construction	1,045.60
July 22	to Clemt. Smith, Treas.	43.56	Aug. 1	for Construction	941.85
Aug. 12	to Clemt. Smith, Treas.	804.11	Nov. 1	for Construction	485.00
Sep. 25	to Clemt. Smith, Treas.	2,000.00			
Oct. 1	to Clemt. Smith, Treas.	64.53			
Nov. 7	to Clemt. Smith, Treas.	436.50			
Dec. 9	to Clemt. Smith, Treas.	9.79			
1830			1830		
Feb. 12	to Clemt. Smith, Treas.	21.65			
Mar. 6	to Clemt. Smith, Treas.	10.50			
May 31	to Foreign Laborers	5.55			
May 31	to Cement (1,487 bls.)	354.22			
1831			1831		
Mar. 11	to Clemt. Smith, Treas.	15.66	May 31	for Construction	54.00
May 31	to Construction	54.00			
1832			1832		
Feb. 25	to Clemt. Smith, Treas.	3.75			
		$10,751.43			$8,118.95

A. P. Osborn, Contractor

Debit			Credit		
1830			1830		
Mar. 24	to Clemt. Smith, Treas.	$2,612.34	Mar. 17	for Construc-tion	$2,902.60
Mar. 24	to Clemt. Smith, Treas.	39.37	May 1	for Construc-tion	3,102.80
Mar. 31	to Clemt. Smith, Treas.	12.00	June 1	for Construc-tion	2,272.40
May 18	to Clemt. Smith, Treas.	3,102.82	July 1	for Construc-tion	3,555.40
May 31	to Cement (226 Bls.).	90.40	Aug. 1	for Construc-tion	2,167.40
Jun 12	to Clemt. Smith, Treas.	2,298.74	Aug. 25	for Construc-tion	900.80
July 7	to Clemt. Smith, Treas.	3,555.45		to Balance	42.21
Aug. 7	to Clemt. Smith, Treas.	1,738.03			
Aug. 31	to Clemt. Smith, Treas.	626.51			
Sep. 30	to Clemt. Smith, Treas.	195.40			
Sep. 30	to Tuscarora Cement (1918 Bls.)	402.78			
Sep. 30	to Quarry Rent	30.00			
Sep. 30	to Construction	240.00			
Nov. 4	to Clemt. Smith, Treas.	125.00			
Nov. 4	to A. B. McFarland	170.00			
1831	To Balance	42.21	1831		
Mar. 11	to Clemt. Smith, Treas.	16.08			
1832			1832		
July 7	to Clemt. Smith, Treas.	219.37	July 2	for Construc-tion	261.58
			1833		
			April 30	for Construc-tion	311.01
		$15,516.50			$15,516.50

Byrne & LeBaron, Contractors

Debit			Credit		
1830			1830		
Oct. 11	to Clemt. Smith, Treas.	$1,200.00	Nov. 1	for Construction	$3,240.28
Nov. 4	to Clemt. Smith, Treas.	2,040.28	Dec. 1	for Construction	1,698.63
Dec. 1	to Clemt. Smith, Agent	1,698.63			
1831			1831		
Jan. 1	to Clemt. Smith, Agent	1,022.21	Jan. 1	for Construction	1,022.21
Mar. 1	to Clemt. Smith, Agent	707.77	Mar. 1	for Construction	707.77
Mar. 18	to Clemt. Smith, Treas.	100.00	Apr. 1	for Construction	1,546.51
Apr. 1	to Clemt. Smith, Agent	4,446.51	May 1	for Construction	4,106.38
May 5	to Clemt. Smith, Agent	4,106.38	May 31	for Construction	4,412.85
May 31	to balance to June 1	15,321.78	Jun 1	for balance from May 31	15,321.78
June 1	to Clemt. Smith, Agent	4,413.05	July 1	for Construction	4,213.15
July 1	to Clemt. Smith, Agent	4,171.17	Aug. 1	for Construction	2,856.66
July 1	to Cement (1,046 Bls.)	219.66	Oct. 1	for Construction	3,297.41
Aug. 1	to Clemt. Smith, Agent	2,780.85	Nov. 1	for Construction	3,511.22
Sep. 1	to Cement (1,018 Bls.)	213.78	Dec. 1	for Construction	4,146.56
Oct. 1	to Clemt. Smith, Agent	3,286.91			
Oct. 1	to Cement (231 Bls.)	48.51			
Nov. 1	to Clemt. Smith, Agent	3,176.26			
Nov. 4	to Clemt. Smith, Treas.	299.00			
Dec. 1	to Clemt. Smith, Agent	3,102.63			

1832			1832		
Jan. 10	to Clemt. Smith, Agent	1,496.29	Jan. 1	for Construction	1,726.43
Feb. 1	to Clemt. Smith, Agent	1,461.98	Feb. 1	for Construction	4,193.52
Mar. 19	to Clemt. Smith, Agent	1,902.83	Mar. 1	for Construction	2,251.41
Mar. 31	to Cement (553 Bls.)	116.13	Apr. 2	for Construction	3,890.28
Apr. 15	to Clemt. Smith, Agent	3,719.33	May 8	for Construction	7,284.55
Apr. 30	to Superintendence	1,522.50	Jun. 1	for Construction	3,252.52
May 19	to Clemt. Smith, Agent	7,000.00	July 1	for Construction	5,641.56
May 19	to Cement (880 Bls.)	184.80	Aug. 1	for Construction	6,457.91
June 19	to Cement (1,407 Bls.)	295.47	Sep. 1	for Construction	1,523.95
June 19	to Clemt. Smith, Agent	2,967.44	Oct. 1	for Construction	1.844.24
June 19	to Clemt. Smith, Treas.	100.00	Nov. 1	for Construction	2,640.50
July 14	to Clemt. Smith, Agent	5,007.41			
Aug. 11	to Clemt. Smith, Agent	6,079.95			
Sep. 11	to Clemt. Smith, Agent	1,492.55			
Oct. 10	to Clemt. Smith, Agent	1,827.33			
Oct. 10	to Cement (847 Bls.)	177.87			

1832			1832
Nov. 10	to Clemt. Smith, Agent	2,462.63	
Nov. 24	to Cement (1,634 Bls.)	343.14	
Dec. 1	to Clemt. Smith, Treas.	5,000.00	
Dec. 26	to Cement (559 Bls.)	117.39	

1833			1833		
Jan. 17	to Clemt. Smith, Treas.	5,000.00	Mar.	for Construction	1,482.80
Jan. 24	to Cement (500 Bls.)	105.00	Apr. 1	for Construction	4,325.20
Feb. 23	to Clemt. Smith, Treas.	5,000.00	Aug. 2	for Construction	22,953.08
Mar. 9	to Clemt. Smith, Treas.	1,334.52	Dec. 6	for Balance	100.00
April 6	to Clemt. Smith, Treas.	4,473.48			
Apr. 20	to Cement (600 Bls.)	126.00			
May 24	to Clemt. Smith, Treas.	6,000.00			
May 24	to Sundries	585.00			
Aug.	to Sundries Deduct	2,721.00			
Aug. 2	to Clemt. Smith, Treas.	1,215.94			
Aug. 2	to Balance	100.00			
Dec. 6	to Clemt. Smith, Treas.	100.00			
		$101,627.58			$101,627.58

1831			1831		
Apr. 1	to Clemt. Smith, Agent	38.00	Apr. 1	for Construction	38.00
1832			1832		
June 15	to Clemt. Smith, Treas.	270.00	Apr. 30	for Construction	581.08
1833			1833		
Apr. 30	to A. P. Osborn	311.08			
June 21	to Gideon Davis	1,562.17			
Aug.	to Clemt. Smith, Treas.	91.50			
1834			1834		
			May 31	for Construction	1,653.67
		$2,272.75			$2,272.75

Gideon Davis, Contractor for Railings
For Aqueducts Nos. 1 and 2

Debit			Credit		
1832			1832		
Sep. 22	to Clemt. Smith, Treas.	12.25	Dec. 29	for Aqueduct No. 1	483.00
Nov. 3	to Clemt. Smith, Treas.	130.00			
Dec. 11	to Clemt. Smith, Treas.	470.66			
1833			1833		
Mar. 23	to Clemt. Smith, Treas.	150.00	June 21	for Aqueduct No. 2	1,562.08
June 21	to Clemt. Smith, Treas.	1,282.17			
		$2,045.08			$2,045.08

Appendix C
T. H. S. Boyd's Description of the Temporary Railroad From Sugarloaf Mountain to Aqueduct No. 2

Excerpted from T. H. S. Boyd, *The History of Montgomery County, Maryland, From Its Earliest Settlement in 1650 to 1879* (Clarksburg, 1879), 80–81.

The Canal Company, in preparing to construct the great Aqueduct at the mouth of Monocacy, first thought of the transportation of ponderous hewn stone from the foot of the Sugar Loaf, by routes over which wagons could not possibly pass, and proceeded to construct the first, and now almost forgotten railroad. . . . Iron rails were not used, the wooden ones, or "string pieces," as they were called, consisted of nothing more than trunks of trees, generally oak, cut from twelve to sixteen feet long, so as to allow the diameter at the smaller end to be not less than eight or ten inches. Along the whole length of these string pieces a groove or triangular trough was cut with an adze from the circumference to the centre, taking out a fourth part of the wood, which left two flat surfaces, forming a right angle at the heart or centre of the log. The trackway was graded and the log, or string piece, put down with one of its flat surfaces parallel with the surface of the ground, and the other perpendicular to it. The perimeter of the car-wheel ran on the flat surface of the groove or trough, and the outside or outward edge of the perimeter moved along the perpendicular surfaces of the string piece on each side of the track, holding the car firmly in its place, and preventing it from running off to the ground. The track was firmly ballasted on the inner and outer side with blast rock. This was generally called, simply, blarst by the Irish laborers, because it consisted of small pieces of rock thrown off by blasting. A smooth path was made between the string pieces to accommodate two horses abreast. No cross ties were used; the weight of the string pieces and the stone ballast was sufficient to bind the track together. When one flat surface of the rail or string piece was worn and split by the pressure of the wheel, the other was turned down by turning the rails "end for end," or from "side to side," of the track, and thus the road was repaired, until it became necessary to put in new string pieces. The road was built up hill and down, through a rough and mountainous country, for the greater part of the way – very little grading being done. The cars consisted of a plain wooden platform only, supported by iron wheels and axles. One wheel, or more, on each car, had cogs on the inside of the perimeter, into which an iron lever could play, so as to lock a wheel or two in going down hill. The lever was held in the hand of the driver of the horses; and when the wheel or wheels were locked, the car, with its great load of hewn rock, would, to the relief of the horses, slide down the hill like a locked wagon on an earthen road. Snow was removed from the track by Irish laborers with shovels. A car containing tools and provisions, with "gigger" cups and big jugs, was dispatched from each terminus of the road to clean off snow, and when the two parties met on the road double giggers were dealt out by the "grog boss," and great hilarity pleasantly followed, unless the laborers happened to be hostile, and then an attempt might be made to repeat the battle of the Boyne. The road was kept in active operation until the Aqueduct was finished, and then abandoned to decay. Most of the string pieces, however, were soon seized by the mountaineers for firewood, and the ballast hauled off to build and repair stone fences.

Appendix D
"Report on Survey of Aqueduct and Miscellaneous Drainage And Overpass Structures on the Chesapeake & Ohio Canal" By C. D. Geisler, 1950

[Excepted Portion of Report Dealing with Aqueducts]

SOURCE: U. S., Congress, House, Committee on Public Lands, Chesapeake and Ohio Canal Report, 81st Cong., 2d sess., 1950, H. Doc. 687, pp. 68–70.

The 11 aqueducts are in various stages of deterioration. Some are in generally good condition and require only resetting of some stones and a pointing up of the open joints. Others have developed partial failure which can be repaired in some cases by rebuilding those sections, whereas in other cases the entire reconstruction of the spans is necessary. The stone used in the construction of the aqueducts is either limestone or sandstone of various grades. Some of the limestone shows considerable decomposition. The stone in some of the aqueducts has disintegrated to such extent that adequate repair of the structure will require the rebuilding of sections with new stone. The rapid deterioration of the stone was undoubtedly due to leakage of water through the aqueducts. Sufficient sound stone can probably be obtained, however, from locks and walls which will be obliterated in the construction of a parkway. The stone so obtained would require very little cutting except for use in the facial ring stones.

The arch barrels of the aqueduct consist of coursed ashlar, the stone being approximately uniform in depth from spring line to crown. The face stones in the spandrel and parapet walls vary from coarsed to uncoursed ashlar, the stonework being generally more formal in those aqueducts near Washington, D.C. than toward the upper end of the canal. Hydraulic lime cement appears to have been used, generally in the voussoir joints and to some extent in the spandrels.

The spandrel construction consists of an outer facing or veneer of ashlar backed with a composite fill material of broken stone and clay. Similar fill overlies the arch barrel to the level of the bottom of the flume. The parapets, or sides of the flume, consist of inner and outer facings of stone with fill material as noted above. The fill is quite compact and well cemented and does not exert much pressure against the facial veneer. However, the fill has little bond with the face stones, requiring the latter to be more or less self-supporting. Furthermore, the wet fill in contact with the face stones appears to have accelerated disintegration of the back of the stones. The upstream parapets average about 5 feet in width, whereas the downstream parapets which served as the towpath average 8 feet to 9 feet in width. Both parapets have a full width coping of stone slabs.

Where failure has occurred in the aqueducts as where part of the structure has collapsed, such failure is believed due to weakness in structural design rather than to disintegration of the stones. The cause of the failure appears to have been the inability of the spandrels to resist the outward pressure of the water. This pressure caused the face stones in the spandrels and piers to fail at or below the elevation of the arch spring line. Following failure of these stones the entire spandrel and parapet gradually gave way. The outward pressure against the parapets also produced transverse tension in the arch barrel causing longitudinal cracks in the arch, and in some cases push-

ing out the outer section of the barrel. Failure apparently occurred first in the upstream side of the aqueducts where the parapets were thinner and had less weight to resist the water pressure.

The structural design of the arch barrels and their abutments appears adequate. However, where there were multiple spans of unequal length, the weight of the piers was insufficient to take one unbalanced arch thrust. There was also inadequate provision in the arch barrels to resist the water pressure against the spandrels.

There is no evidence of settlement in either the abutment or pier foundations. The existing footings are believed adequate for future support of the structures. However, it would be desirable to check the foundation condition at each footing before any major repair work is done on the arch spans.

It is suggested that the repair of the stone aqueducts be substantially as follows: In many of the downstream spandrel and parapet walls, and also in some of the upstream walls, satisfactory repair should require only the removing and replacing of loose spalled or disintegrated stones and the grouting of joints with cement mortar. However, in walls which have been pushed outward or in which many of the stones are dislodged or show failure, the entire face of the spandrel and parapet should be removed. The fill in back of the stones should also be removed to a depth of at least 1 foot. The face stones should be relaid with cement joints, using new stones where necessary. This facing should then be backed with a 1-foot thickness of concrete. The new walls should be tied to the opposite walls or anchored laterally with reinforced concrete cross ties spaced about 15 feet apart. Enough of the existing fill over the structure must be removed to permit the construction of these ties. Following the repair of the spandrel walls, all open joints in the piers and arch barrels should then be cleaned and packed with cement mortar. In structures where the arch barrel requires major repair, this work should be done prior to the reconstruction of the spandrels or parapets. Where the strength of the existing arch barrel may be in doubt due to general disintegration of the voussoir stones, it may be economical to remove the fill over the arch, grout the voussoir joints from the top, and place a backing of concrete over the entire arch barrel. This concrete backing would serve to hold the spandrel walls against lateral displacement without the use of the concrete cross ties mentioned above. Should a section of the arch barrel need reconstruction, falsework will be required and the new voussoir stone set on the forms.

After the water is removed from the aqueducts, future disintegration of the stone should proceed at a very slow rate. Furthermore, where the stones can be grouted so as to provide full mortar joints, not only will the stones be given more protection from the weather but the mortared joints will reduce the concentrated stresses on the stones by making the pressures on the bearing surfaces more uniform. In addition, the use of concrete will take a good deal of the load off of the stones and permit much of the softer stone to remain in the structure.

It is probable that suitable repair of the wing walls can be made in most cases by removing and replacing stones which have dislodged, and grouting all open joints with mortar. Where large sections of the wing walls have gone out, they should be result as gravity walls, in which the facial stones should be given a structural backing of either concrete or stone masonry.

ILLUSTRATIONS

1. Photograph made in 1936 of the berm side of the Monocacy Aqueduct. From Historic American Buildings Survey files, Library of Congress.

2. Photograph made in 1936 of the berm side of the Monocacy Aqueduct, looking west. From Historic American Buildings Survey files, Library of Congress.

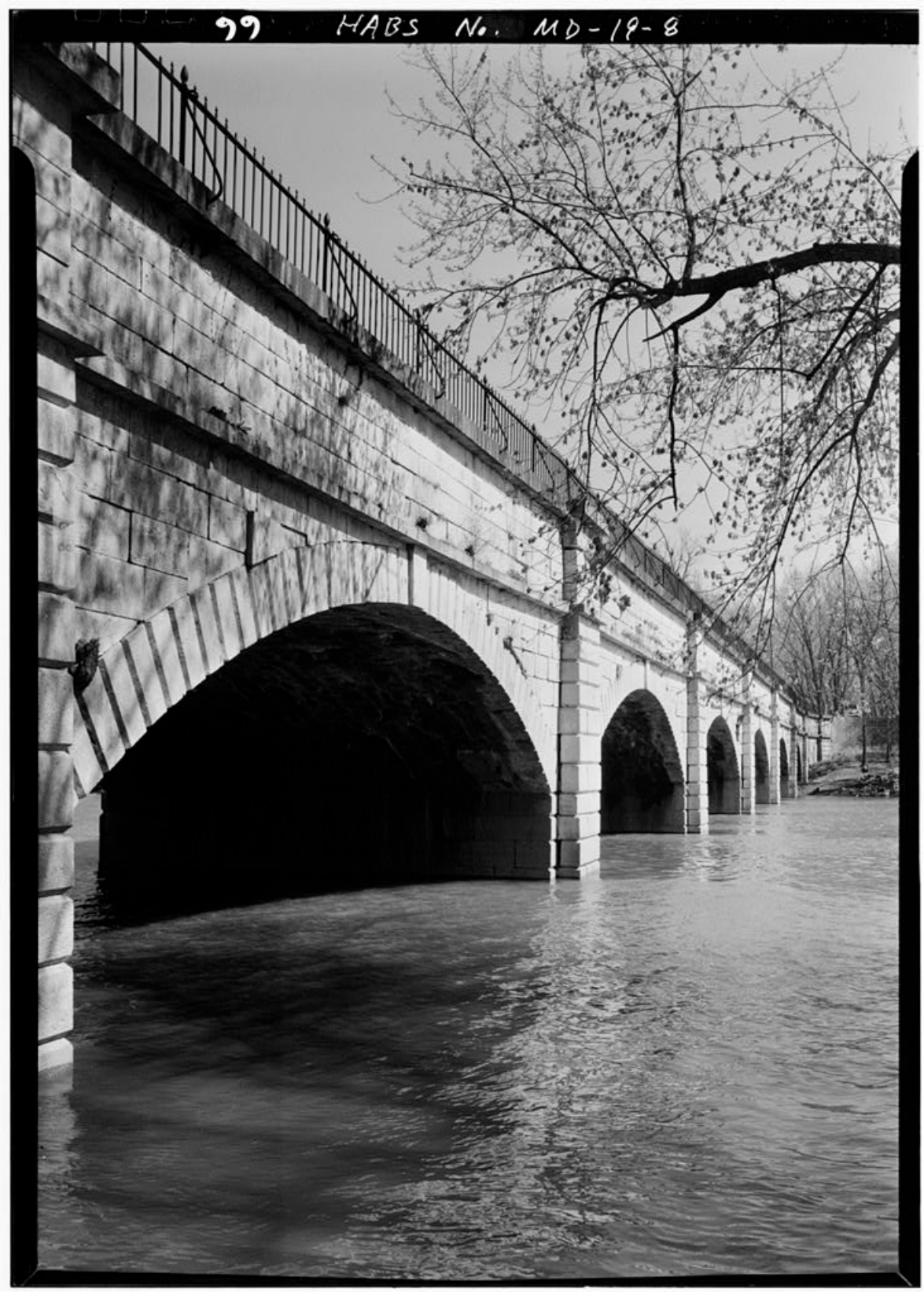
3. Photograph made in 1936 of the canal bed and towpath and berm parapets of the Monocacy Aqueduct, looking east. From Historic American Buildings Survey files, Library of Congress.

4. Photograph made in 1936 of the southeast abutment wall of Monocacy Aqueduct. From Historic American Buildings Survey files, Library of Congress.

5. Photograph made in 1936 of the towpath parapet, coping and iron railing of the Monocacy Aqueduct, looking south. From Historic American Buildings Survey files, Library of Congress.

6. Photograph made in 1936 of the berm side of the Monocacy Aqueduct. From Historic American Buildings Survey files, Library of Congress.

7. Photograph made in 1959 of the towpath side of the Monocacy Aqueduct. From Historic American Buildings Survey files, Library of Congress.



8. Photograph made in 1959 of the towpath side of the Monocacy Aqueduct. From Historic American Buildings Survey files, Library of Congress.

9. Photograph made in 1959 of the southeast abutment wall of the Monocacy Aqueduct. From Historic American Buildings Survey files, Library of Congress.

10. Photograph made in 1959 of the canal bed, towpath and berm parapets of the Monocacy Aqueduct, looking west. From Historic American Buildings Survey files, Library of Congress.

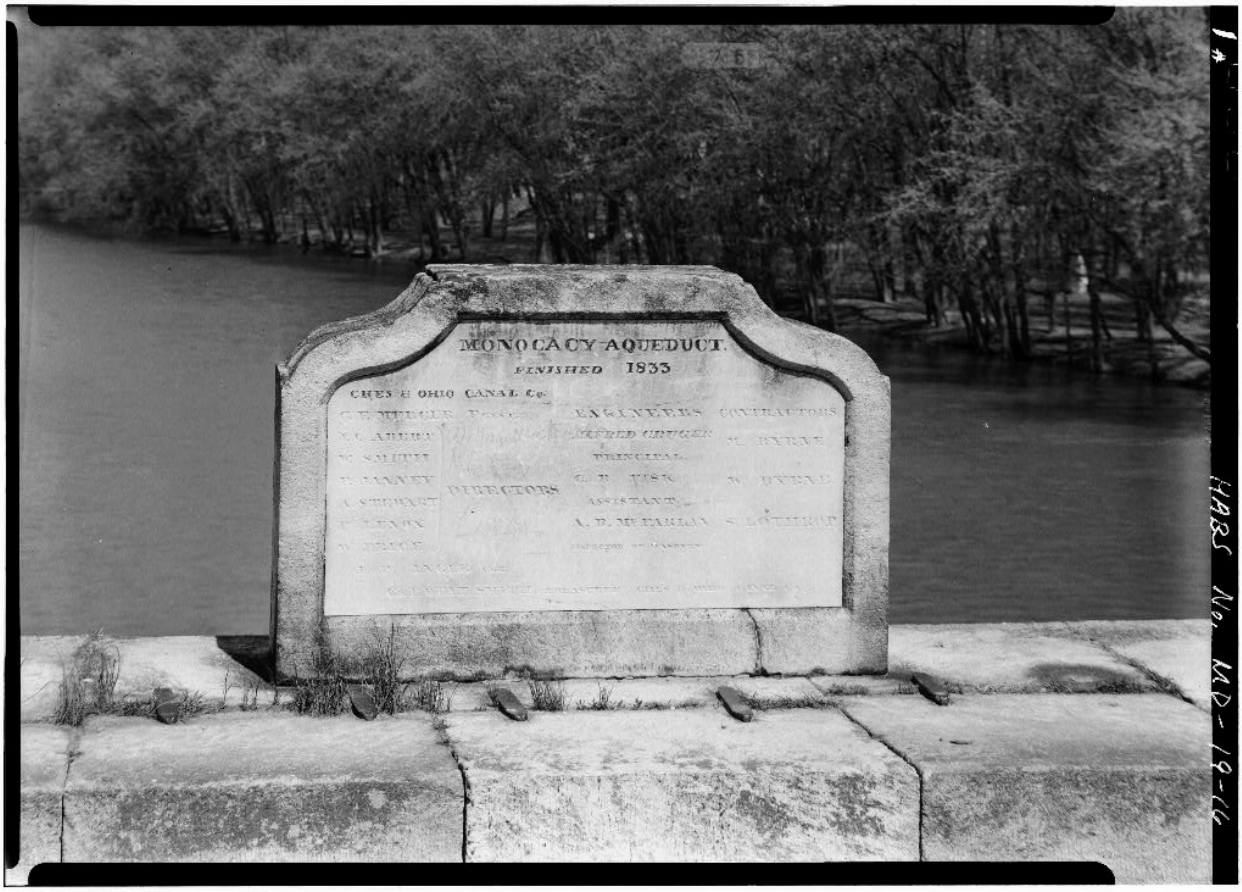
11. Photograph made in 1959 of the canal bed, berm parapet and towpath of the Monocacy Aqueduct, looking east. From Historic American Buildings Survey files, Library of Congress.

12. Photograph made in 1959 of the canal bed, berm parapet and towpath of the Monocacy Aqueduct, looking west. From Historic American Buildings Survey files, Library of Congress.

13. Photograph made in 1959 of the towpath and iron railing of the Monocacy Aqueduct. From Historic American Buildings Survey files, Library of Congress.

14. Photograph made in 1959 of the towpath side and iron railing of the Monocacy Aqueduct. From Historic American Buildings Survey files, Library of Congress.

15. Photograph made in 1959 showing detail of the iron railing on the towpath side of the Monocacy Aqueduct. From Historic American Buildings Survey files, Library of Congress.



16. Stone tablet on berm parapet of Monocacy Aqueduct.
From Historic American Buildings Survey files, Library of Congress.

MONOCACY AQUEDUCT
FINISHED 1833

CHES & OHIO CANAL Co.

C. F. MERCER, PREST.		**ENGINEERS**	**CONTRACTORS**
J.J. ABERT		ALFRED CRUGER	
W. SMITH		PRINCIPAL	M. BYRNE
P. JANNEY	DIRECTORS	C. B. FISK	
A. STEWART		ASSISTANT	W. BYRNE
P. LENNOX		A.B. McFARLAN	
W. PRICE		INSPECTOR OF MASONRY	S. LOTHROP

J. P. INGLE, CLK.
CLEMENT SMITH, TREASURER CHES & OHIO CANAL Co.

BIBLIOGRAPHY

I. Primary Sources

1. *Manuscript Materials*

Washington, D.C. National Archives. Record Group 79. Assessment Book for Sections 19-38, 1828-31. 1 vol.

_____. Assessment Book of the 5th Residency of the 1st Division, 1829-33. 1 vol.

_____. Clippings, ca. 1861-93.

_____. Correspondence of Office of Trustees, 1913-38.

_____. Deeds and Other Records Concerning Land Titles, 1828-78.

_____. Drafts of Letters Sent by the Chief Engineer, 1836-38, 1846-52.

_____. Drawings and Other Records Concerning Construction, 1828-1937.

_____. Index to Correspondence, 1913-38.

_____. Index to Proceedings of Stockholders, 1828-83. 1 vol.

_____. Indexes to Proceedings of the President and Directors, 1828-90. 2 vols.

_____. Ledgers, 1828-90. 5 vols.

_____. Legal Records, ca. 1828-1900.

_____. Letters and Reports from the Superintendent of the Georgetown Division, Jan.-June 1871.

_____. Letter Book of the Resident Engineer of the 1st Residency of the 1st Division, 1828-31. 1 vol.

_____. Letter Book of the Resident Engineer of the 5th Residency of the 1st Division, 1828-31. 1 vol.

_____. Letters Received by the Chief Engineer, 1834-52.

_____. Letters Received by the Office of the President and Directors, 1828-89.

_____. Letters Received by the Office of the President and Directors, 1873-80.

_____. Letters Sent by the Chief Engineer, June 12, 1838-July 3, 1839. 1 vol.

_____. Letters Sent by the Office of the President and Directors, 1828-70. 12 vols.

_____. Letters Sent by the Office of the President and Directors, 1879-81. 1 vol.

_____. Printed Materials, 1816-1907.

_____. Proceedings of Stockholders, 1828-89. 5 vols.

_____. Proceedings of the President and Directors, 1828-90. 13 vols.

_____. Records Concerning Land, ca. 1828-73.

_____. Reference Book Concerning Land Titles, 1829-68. 1 vol.

_____. Register of Letters Received by the Chief Engineer, 1835-40. 1 vol.

_____. Register of Letters Received by the Office of the President and Directors, 1828-88. 3 vols.

_____. Register of Letters Sent by the Office of the President and Directors, 1828-70. 1 vol.

2. *Printed Documents*

Annual Reports. Chesapeake and Ohio Canal Company, 1829-89.

Report of the General Committee of the Stockholders of the Chesapeake and Ohio Canal Company. Washington, 1839.

Report of W. R. Hutton, Chief Engineer, As to Condition of Chesapeake and Ohio Canal, With Estimate of Cost of Extraordinary Repairs Required During the Current Year, August 14th, 1872. Annapolis, 1872.

U.S. Congress. House. *Chesapeake and Ohio Canal Report*. 20th Cong., 1st sess., 1828, H. Doc. 141.

_____. *Letter from the Secretary of War, Transmitting Estimates of the Cost of Making a Canal from Cumberland to Georgetown*. 20th Cong., 1st sess., 1828, H. Doc. 192.

_____. Committee on Roads and Canals. *Chesapeake and Ohio Canal: Report to Accompany H. R. 94*. 23d Cong., 1st sess., 1834, H. Doc. 414.

_____. Committee on Public Lands. *Chesapeake and Ohio Canal Report.* 81st Cong., 2d sess., 1950, H. Doc. 687.

II. Secondary Sources

1. *Books*

Boyd, T. H. S. *The History of Montgomery County, Maryland, From Its Earliest Settlement in 1650 to 1879*. Clarksburg, 1879.

Ferris, Robert G. *Signers of the Declaration of Independence.* Washington, 1973.

Hahn, Thomas F. *Towpath Guide to the C & O Canal (Section Two).* Washington, 1971.

Kapsch, Robert J. and Elizabeth Perry Kapsch. *Monocacy Aqueduct on the Chesapeake & Ohio Canal.* Poolesville, MD: Medley Press, 2005.

Sanderlin, Walter S. *The Great National Project.* Baltimore, 1946.

_____. *A Study of the History of the Potomac River Valley.* Washington, 1950.

Wolfe, George Hooper. *I Drove Mules on the C & O Canal.* Dover, 1970.

Unrau, Harlan D. *The Chesapeake & Ohio Canal Historic Resource Study.* 2007. Online: www.nps.gov/history/history/online_books/choh/unrau_hrs.pdf

2. *Periodicals*

Bearss, Edwin C. “1862 Brings Hard Times to the Chesapeake and Ohio Canal.” *West Virginia History* 30 (January 1969): 436-62

Sanderlin, Walter S. “The Vicissitudes of the Chesapeake and Ohio Canal During the Civil War.” *Journal of Southern History* 11 (1945): 51-67.

3. *Technical Studies*

Larrabee, Edward McMillan. “A Survey of Historic and Prehistoric Archeological Sites Along the Chesapeake & Ohio Canal National Monument, 1961-1962,” NPS MS, 1961.

Miele, John R. “The Chesapeake and Ohio Canal: A Physical History.” NPS MS, 1968.